

5 Programs That Should Be On Your Radar for 2020

January 2020

www.GrayAssociates.com

Today's Presenters

GRAYASSOCIATES

Bob Atkins, CEO



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Marketing Director



Lisa Piatek,
Regional Vice President



Pete Morton
Regional Vice President



Christina Varon
Regional Vice President



I. Introductions

II. Methodology

III. Quantum Computing

IV. Autonomous Vehicles

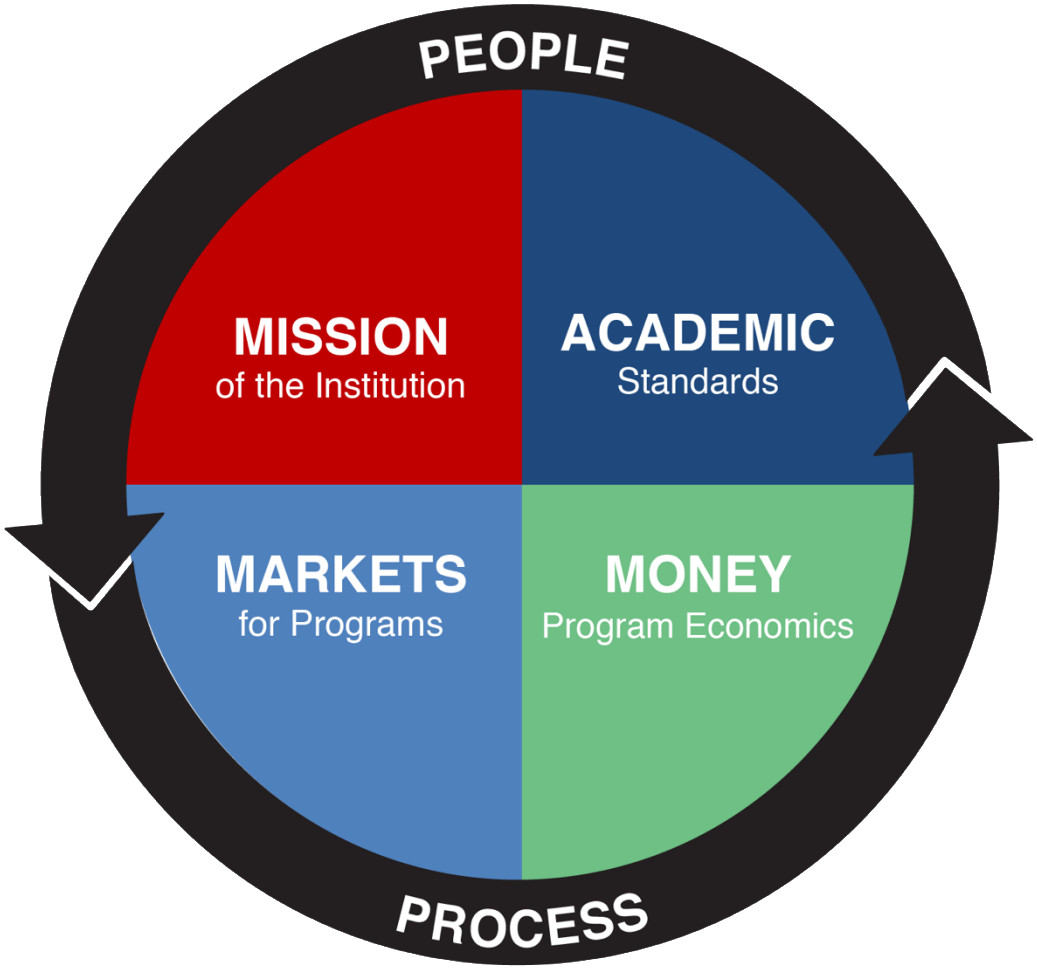
V. Microbiome

VI. Cannabis

VII. Esports

Who is Gray Associates?

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The Challenge

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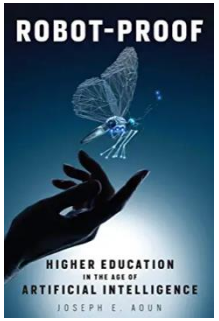
Identifying and determining when an emerging area is worth evaluating as a potential new program is both an art and a science.

- Truly new programs are not well represented in the usual range of structured data sources such as IPEDs, job classification systems and standardized inquiry data.
- Emerging programs, by their nature, do not fit into existing fields nor are they reflected in employment or education statistics.
- Emerging areas increasingly represent a combination of previously independent areas of study, often due to the integration and influence of technology and new applications.
- Evaluating broader trend data, listening to employers, and using keyword search are among several ways to give shape to potential new program areas.
- When possible, we seek to speak to experts who are able to look forward and identify the competencies and skills that are now, or will soon be, needed in the workforce.

Gray uses a wide variety of sources to identify possibilities

NIH

DARPA



coursera

NASA

THE FUTURE OF EVERYTHING

WSJ



in

The FUTURE of WORK

Venture Capital $

Google

glassdoor

edX

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When evaluating a possible emerging field, consider these elements:

Timing

Degree Fit

Size

Difficulty

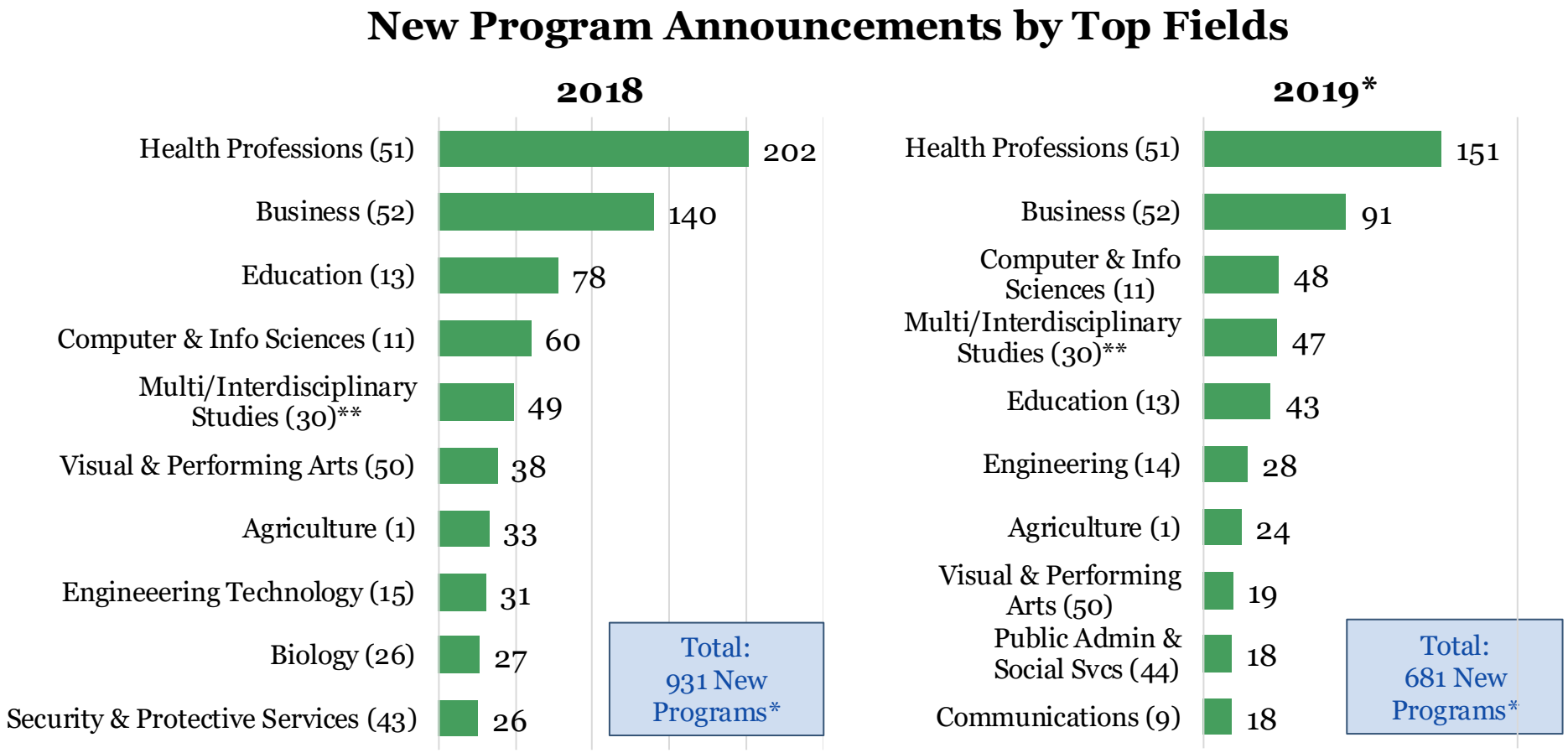
Mission

Scale

New Program Announcements by Field

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Health and business fields accounted for the most new program announcements.

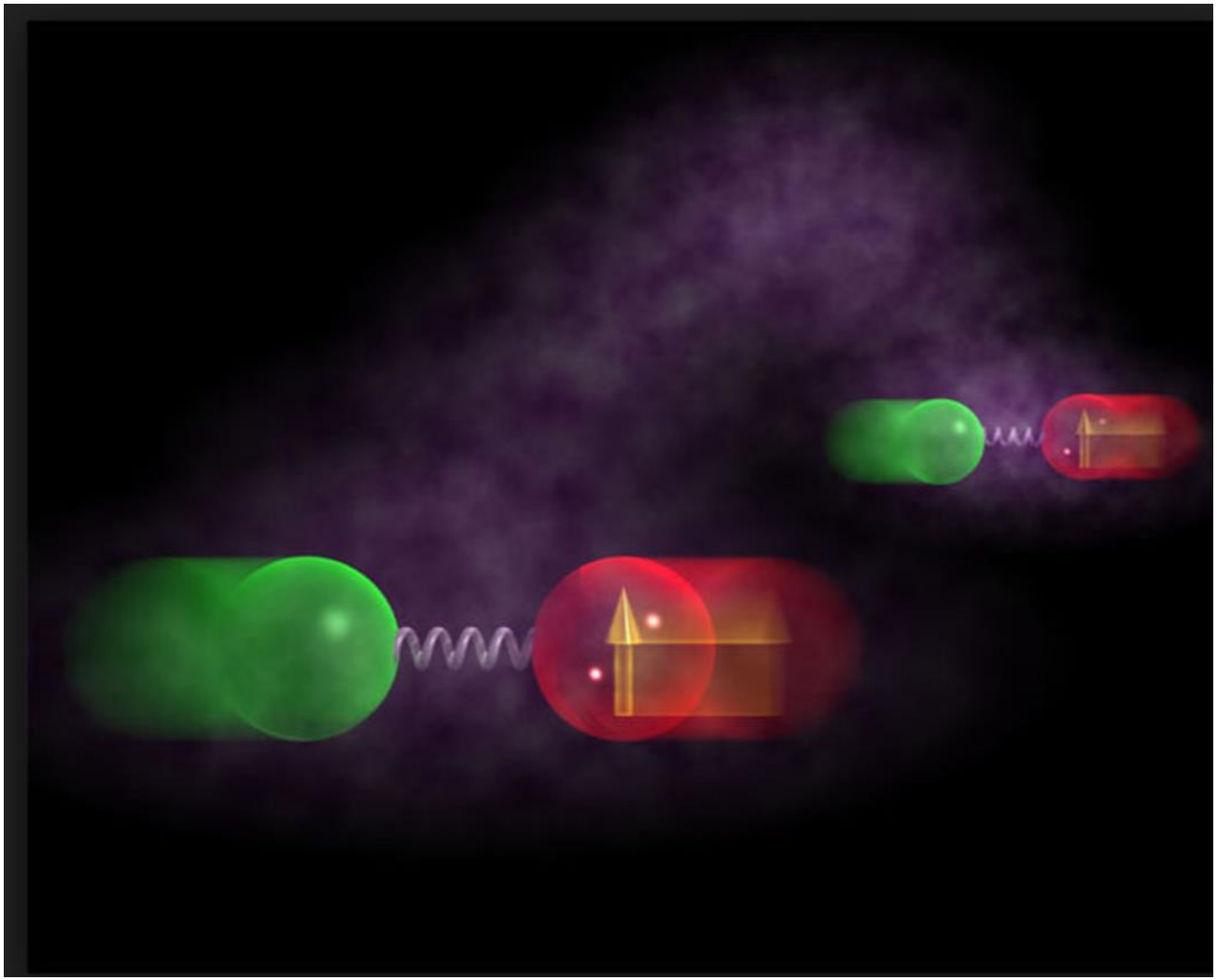


* Program announcements through September 30, 2019. Does not include dual degree programs.
** Includes 2020 IPEDS proposed CIP code for Data Analytics/Data Science
Source: Gray Associates analysis of new program announcements.

QUANTUM COMPUTING



Spookiness at a Distance: Quantum Entanglement



August 16, 2016: China launched the Quantum Entanglement Satellite.

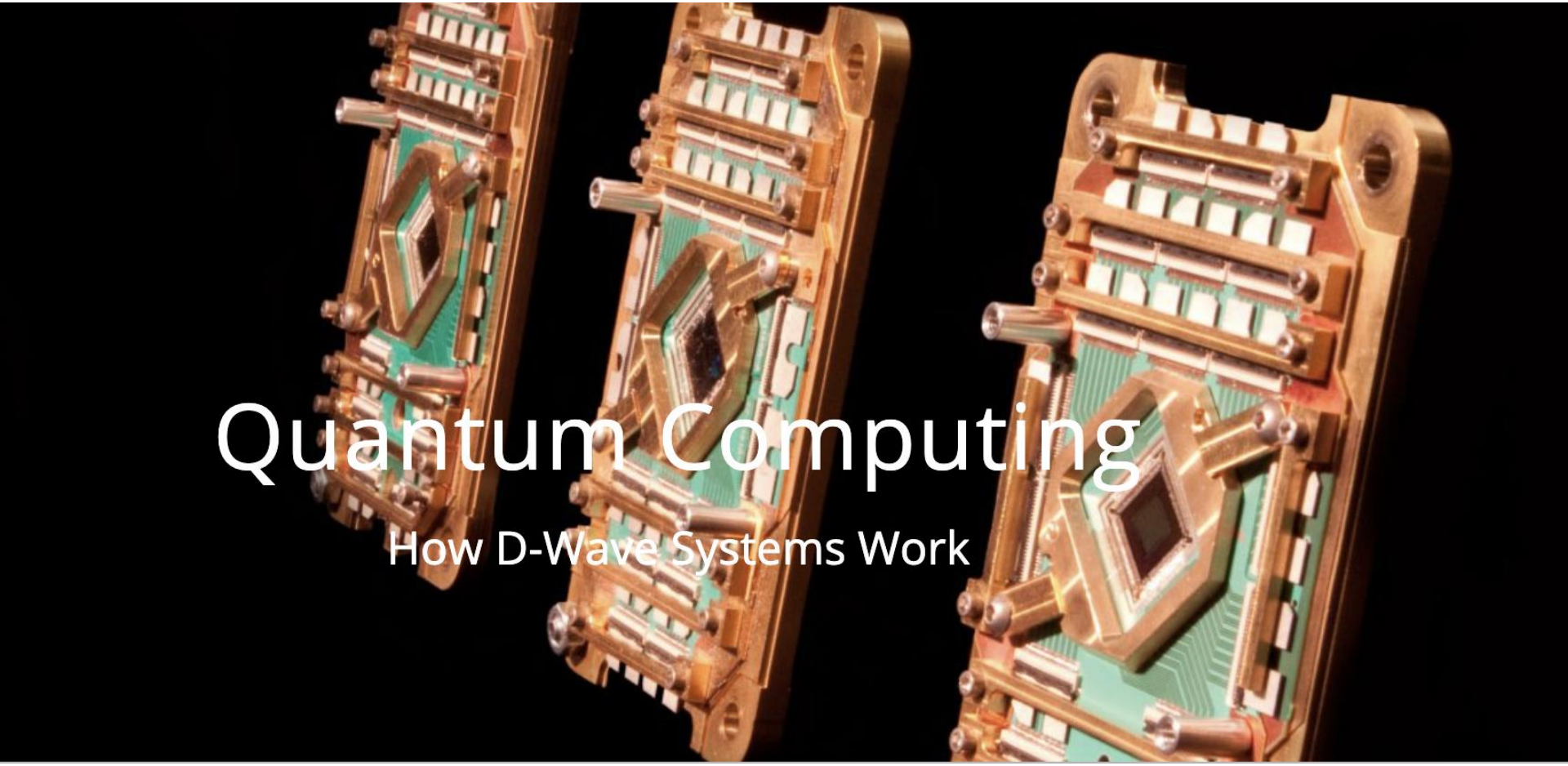


10,000 years of computing done in 200 seconds…

Google: "Quantum Supremacy"



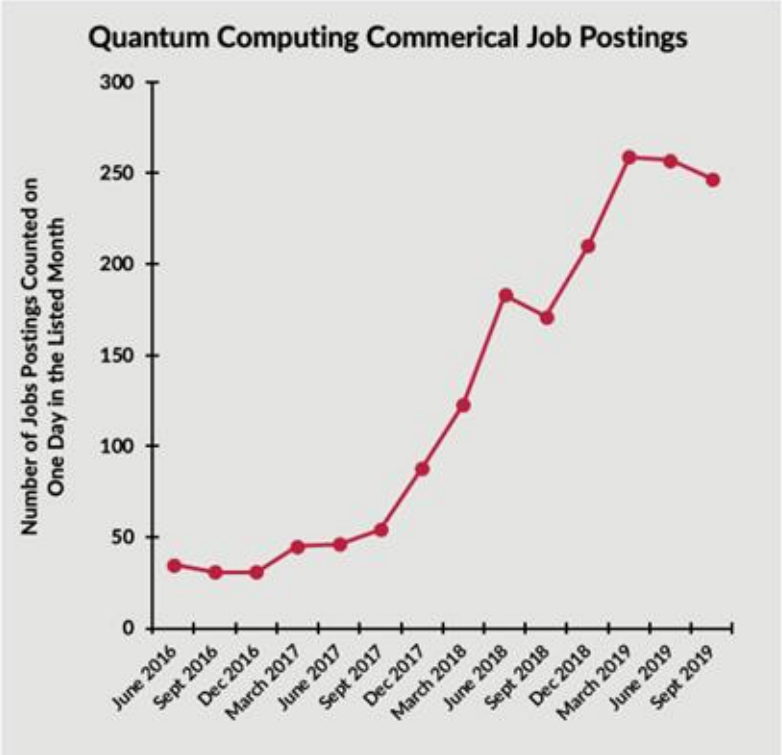
Well, not all of us, but cutting edge analysts can use these tools, now.



Quantum: Employment

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Employment opportunities are still limited, but evolving from academic to commercial.



Company	Position
Alibaba Group	▪ Quantum Scientist, ▪ Quantum Scientist, Algorithms
Amazon Corporate	▪ Quantum Consultant
Atom Computing	▪ Quantum Engineer
Bluemont Tech&Rsch	▪ Quantum Research Assistant
Booz-Allen Hamilton	▪ Quantum Research Data Scientist ▪ Quantum Scientist
ColdQuanta Inc.	▪ Control Systems Quantum Hardware, ▪ Opto-Mechanical Engineer – Quantum
Ford Motor Company	▪ Research Engineer – Algorithms
Goldman Sachs	▪ Lead Quantum Researcher – Research & Development Engineering
Google	▪ Hardware Engineer; Quantum AI, ▪ Quantum Measurement Engineer, Hardware Engineer, Quantum AI, ▪ Research Scientist, Experimental Quantum Computing

Sources: https://www.physics.wisc.edu/mspqc; https://quantumcomputingreport.com/jobs/jobs-u-s-canada/

University of Wisconsin-Madison: MS, Physics – Quantum Computing

- Intensive professional Master's program
- One year, 30 credits
- $1,600/ credit hour.

Fall Semester

Introduction to Quantum Mechanics or Quantum Mechanics

Thermal Physics or Statistical Mechanics

Introduction to Quantum Computing Physics Elective

Spring Semester

Solid State Physics or Advanced Solid State Physics

Atomic and Quantum Physics or Introduction to Atomic Structure

Advanced Quantum Computing

Physics Elective

Summer Semester

Quantum Computing Laboratory

Directed Study

Quantum Computing

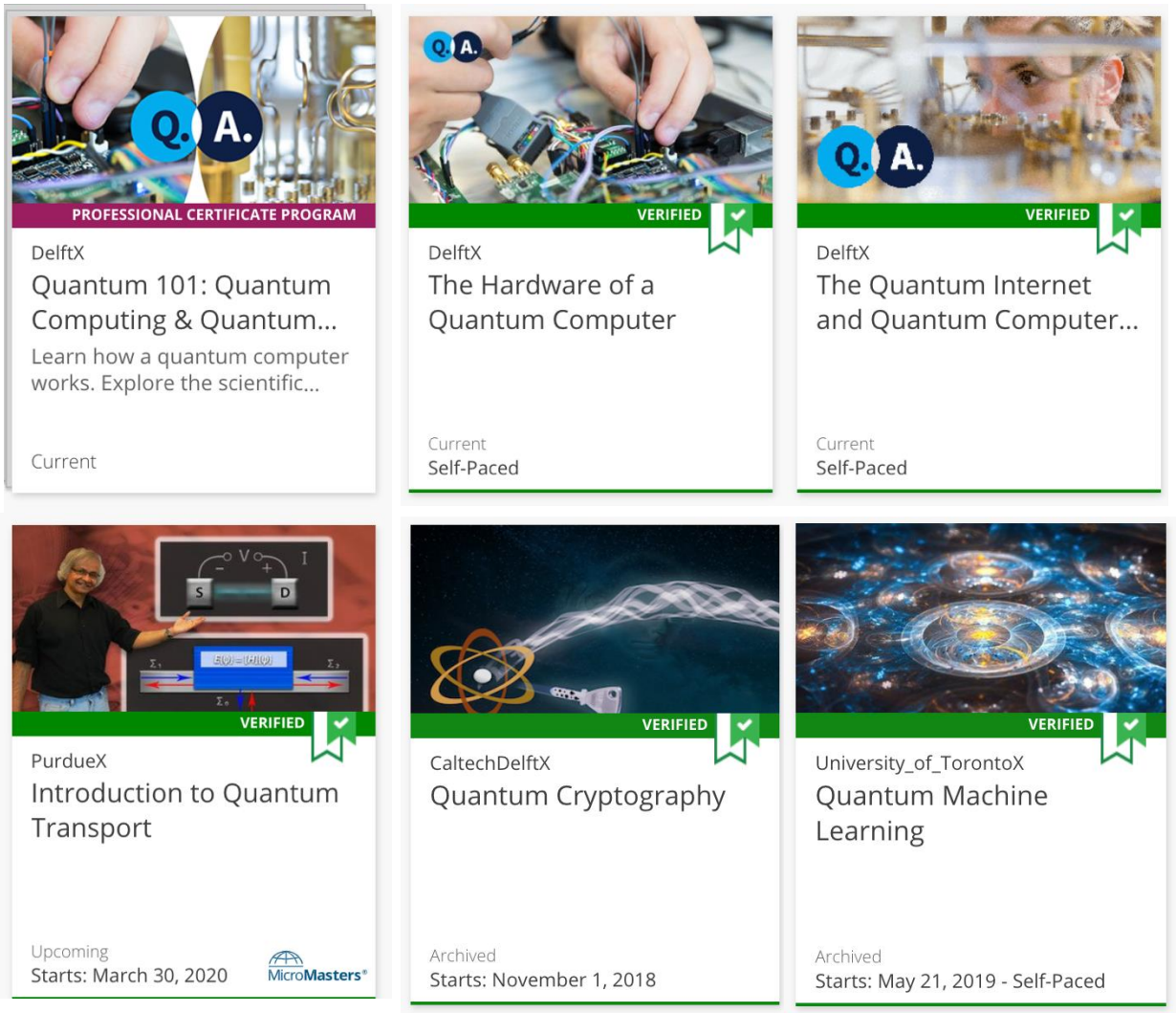
Master of Science in Physics



Gain advanced conceptual, mathematical, and experimental knowledge of quantum computing to promote the development of this future technology with UW–Madison's Master of Science in Physics: Quantum Computing.

Source: https://guide.wisc.edu/graduate/physics/physics-ms/physics-quantum-computing-ms/?_ga=2.181360290.409077863.1577985529-245312073.1576170551&_gac=1.149627394.1576170557.EAIaIQobChMIzpPa6cyw5gIVhpOzCh0mzQj3EAAYAiAAEgLZmPD_BwE

edX offers programs and courses.



Source: edX.org

AUTONOMOUS VEHICLES



Unmanned, or autonomous, vehicles function without human operators either in the air, on the surface, or over/under water.

- Drones
- Self-driving cars, trucks, buses, trains
- Robo taxis
- VTOLs, air taxis, aeromobiles
- Underwater drones, UUVs, boats





- $8.3 billion in military spending
- 1.5 million registered drones

Autonomous vehicles could revolutionize the way we travel and work.

- The global autonomous vehicle market was estimated at $54.23 billion in 2019; it could grow to $556.67 billion by 2026.











Sources:
https://www.google.com/search?q=flying+taxi&source=lnms&tbm=isch&sa=X&ved=2ahUKEwj2ofa2iPXmAhVEuZ4KHabpADMQ_AUoA3oECBIQBQ&biw=1156&bih=796#imgrc=zmWziJrvKHjOeM:

Widespread adoption faces significant obstacles.



To Make Self-Driving Cars Safe, We Also Need Better Roads and Infrastructure

Ruffling feathers
Why drones could pose a greater risk to aircraft than birds

Self-Driving Uber Car Kills Pedestrian in Arizona, Where Robots Roam

Out with the old, in with the new.

Old



New

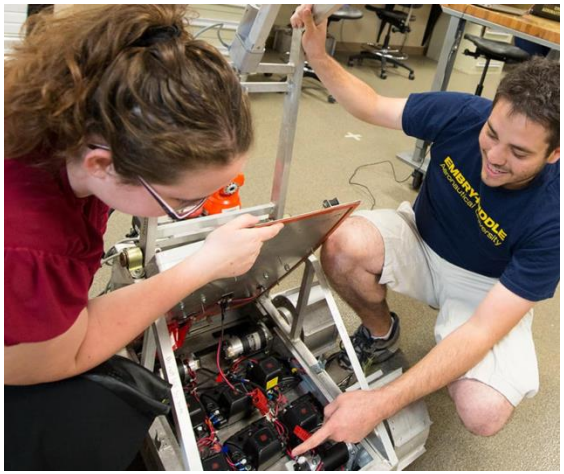


Sources: https://www.technologyreview.com/the-download/609747/self-driving-cars-endanger-nearly-four-million-jobs-but-could-create-a-7/; https://www.rand.org/blog/2017/08/what-autonomous-vehicles-could-mean-for-american-workers.html; https://www.auvsi.org/our-impact/economic-report; https://www.captechu.edu/fields-of-study/unmanned-systems; https://www.cnbc.com/2018/08/10/autonomous-vehicles-are-creating-jobs-heres-where.html

Many of these new jobs will require college degrees or specialized training.

- **20+ programs** announced.
- Certificate and associate programs typically focus on **drone piloting** and operations.
- Bachelor's and graduate programs focus on **UAV technology**, including software and hardware engineering, and even cybersecurity.
- Future courses or programs may be needed to address regulatory and public policy issues, cybersecurity, supply chain and logistics management, and sales and marketing.
- MOOCs (edX, Coursera, Udacity) offer courses and micro-credentials for self-driving car technology.





University of Southern Mississippi, Unmanned Maritime Systems (UMS) Certificate

- Launched in May 2017 with a class of 15 civilian and military personnel.
- The three-month program provides working operational knowledge of a variety of autonomous marine survey vehicles and an understanding of the environment in which they operate.

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

Plan of Study:

- MAR 431: Basic Marine Instrumentation (3 hours)
- MAR 434: Operating Instrumentation in Marine Environments (3 hours)
- MAR 433: Marine Autonomous Vehicles (3 hours)
- MAR 433L: Marine Autonomous Vehicles Lab (1 hour)

Student Learning Outcomes/Objectives:

- SLO1: Students will be able to evaluate the specific requirement of a given mission, consider the environmental limitations, and select the appropriate hardware for the task.
- SLO2: Students will be able to read schematics, assemble electronic components, and program micro-controllers similar to those used in modern undersea vehicles.
- SLO3: Students will be able to properly determine and adjust the ballast and trim of several types of autonomous undersea vehicles varying conditions.
- SLO4: Students will be able to troubleshoot failures in cables, connectors, and simple electronic components.
- SLO5: Students will be able to properly plan a glider mission and write the operational program with which to execute it.
- SLO6: Students will be able to properly plan a powered AUV (Ivers, Remus, ISE, Seabed) mission and write the operational program with which to execute it.

Source: https://www.usm.edu/school-ocean-science-and-technology/unmanned-maritime-systems-ums-certification; https://www.navy.mil/submit/display.asp?story_id=100218

Atlantic Cape Community College, AAS, sUAS Technician

This program prepares students for a career as a small-unmanned aircraft system technician. Upon successful completion of the program, you will have basic proficiency in the area of sUAS operations, general maintenance and repair. You will also be knowledgeable of the use of a sUAS for the collection of and pre and post processing of aerial images and videos and geospatial data collection.

You will be required to sit for and pass a Federal Aviation Administration knowledge exam. Passing this examination leads to the earning of the FAA's Remote Pilot Certificate with a Small Unmanned Aircraft Systems Rating. The RPC allows for the safe commercial operation of less than 55 lbs. drones in the National Airspace System. This program requires off campus field trips and fieldwork. Students are required to develop a portfolio containing examples of completed projects and selected examples of coursework.

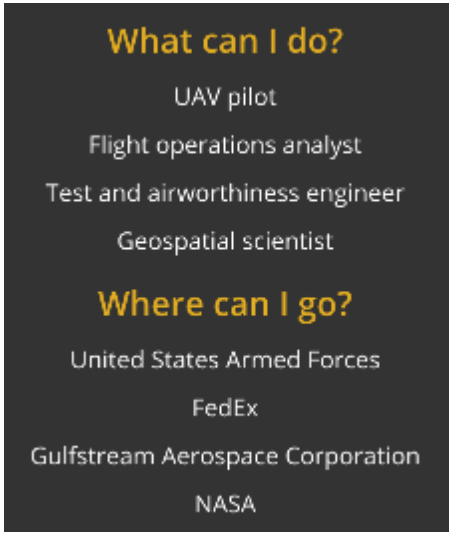
ATLANTIC CAPE COMMUNITY COLLEGE

ATCT120 – Aviation Weather
AVIT140 - sUAS Operations Multi-Rotor
AVIT185 – Remote Sensing Using Unmanned Aircraft
AVIT225 –Mobilizing a Drone-Powered Economy
AVIT263 – Aerial Video Production
AVIT290 – Unmanned Aircraft Systems Capstone Project
AVIT135 – Introduction to UAS
AVIT250 – Small Unmanned Aircraft Systems Maintenance and Repair
CISM143 – Introduction to Project Management
CISM280 – Capstone Portfolio
ENVL122 – Agriculture Technology
ENGR125 – Introduction to Electronics
GIST101 – Introduction to Geographic Information Systems

Source: http://www.atlantic.edu/drones/index.php

Purdue University, BS, Unmanned Aerial Systems

- The program focuses on "the entire system surrounding the unmanned aerial industry, including design, operations, sensors, commerce and policy."
- The Association for Unmanned Vehicle Systems International believes 70,000 new jobs will be created within three years after unmanned aircraft are integrated into the U.S. airspace system.

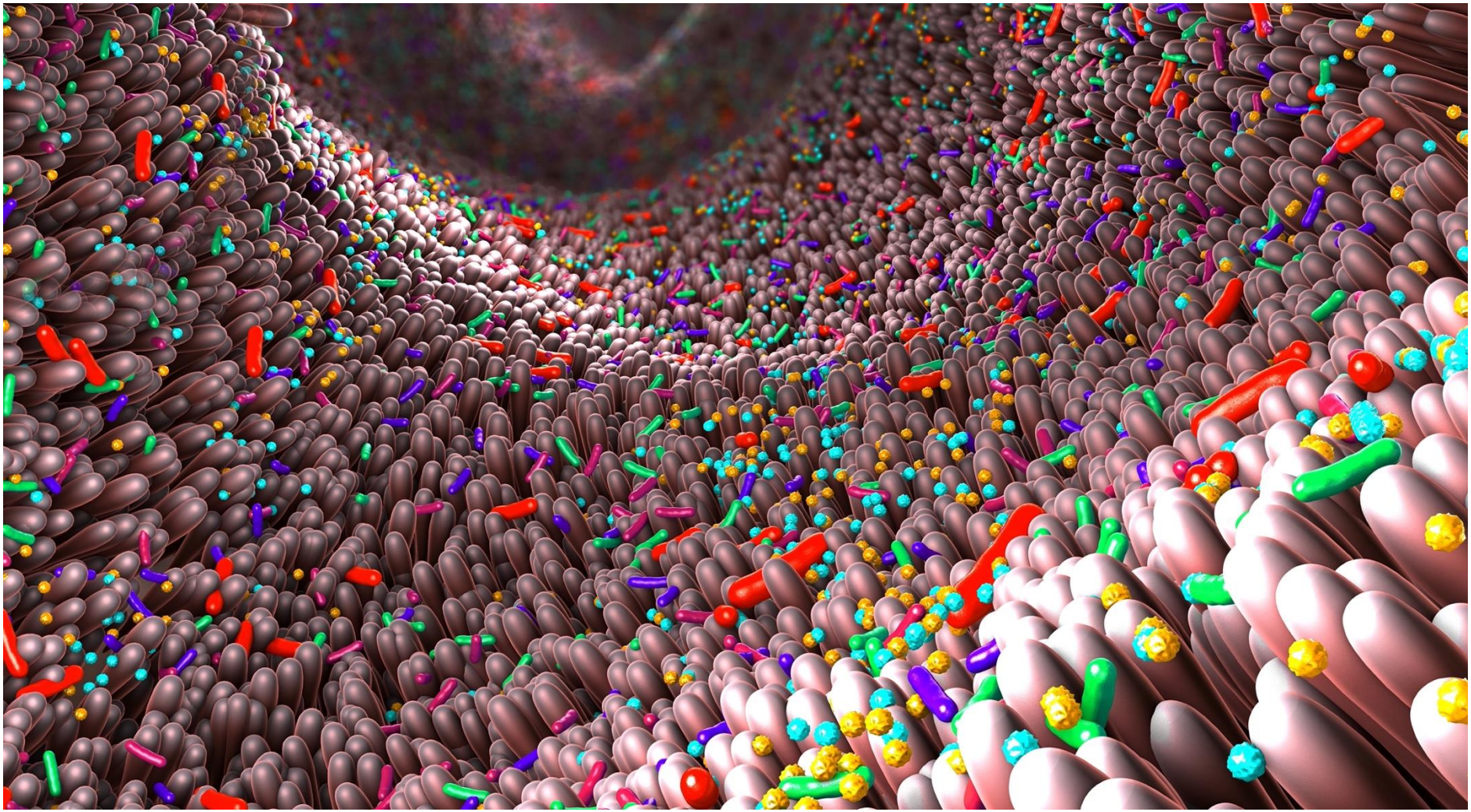


Core courses

AT 10000 - Introduction To Aviation Technology
AT 10200 - Aviation Business
AT 10300 - Aerospace Vehicle Propulsion And Tracking Systems
AT 10900 - Unmanned Aerial Systems Design And Construction
AT 11900 - Unmanned Aerial Systems Inspection And Repair
AT 14400 - Private Pilot Lectures
AT 20200 - Aerospace Vehicle Systems Design, Analysis And Operations
AT 20300 - Aviation Operations Management
AT 20900 - Civilian Unmanned Aerial Systems
AT 21900 - Unmanned Aerial Systems Design, Build, Test
AT 28600 - National Airspace Systems Operations
AT 30900 - Unmanned Autonomous Aerial Systems
AT 31900 - Unmanned Aerial Systems Applications, Data And Documentation
AT 40900 - Unmanned Aerial Systems Capstone I
AT 41901 - Unmanned Aerial Systems Capstone II

Source: https://polytechnic.purdue.edu/degrees/unmanned-aerial-systems

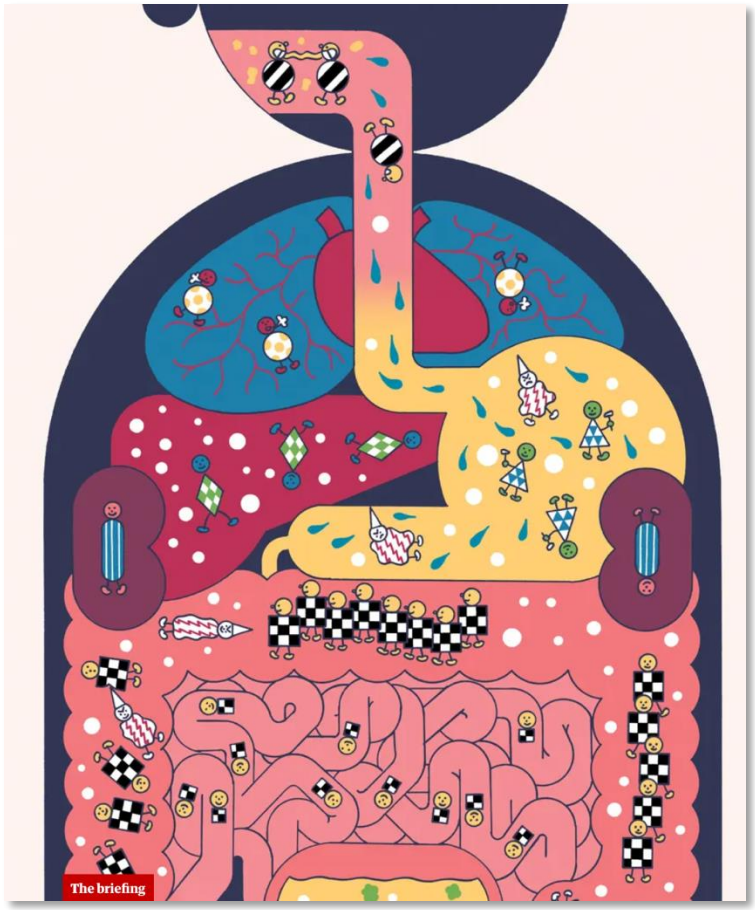
MICROBIOME



Microbiome: What is it?

The study of the microbiome is an important trend in disease treatment, nutrition, wellness, and even mental health.

- **Definition:** The microbiome is the genetic material of all the microbes - bacteria, fungi, protozoa and viruses - that live on and inside the human body. It can weigh as much as five pounds.
- The microbiome is believed to have wide-ranging impacts on human health and wellness, including diseases and chronic conditions such as cancer, diabetes, and obesity, the immune system, nutrition and vitamin synthesis, and brain function and mental health.
- The microbiome may also affect how individuals respond to certain drugs, raising the possibilities of personalized treatments and therapies.
- The **Human Microbiome Project** (HMP) provided a roadmap for research and innovation with 14 terabytes of publicly available data.



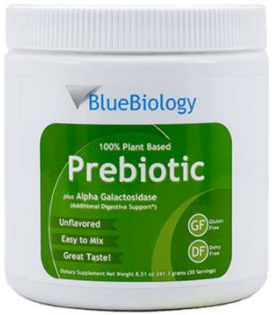
"The human microbiome is a relatively new, but incredibly exciting and important, field of study. It's the missing piece in the wellness puzzle." – Forbes

Source: https://depts.washington.edu/ceeh/downloads/FF_Microbiome.pdf; https://www.theguardian.com/news/2018/mar/26/the-human-microbiome-why-our-microbes-could-be-key-to-our-health; https://nccih.nih.gov/health/probiotics/introduction.htm#hed1

As understanding of the microbiome evolves, so do medical and commercial applications for products and treatments related to it.

- Market definitions and size estimates vary, but double-digit growth is predicted for some sectors and products over the next five to ten years.
  - **Diagnostics:** Growing from $892 million in 2018 to $1.9 billion by 2026
  - **Therapeutics:** $1.24 billion by 2020, $2.16 billion by 2026
  - **Probiotics**: $73.8 billion by 2024
  - **Prebiotics:** $750 million by 2024



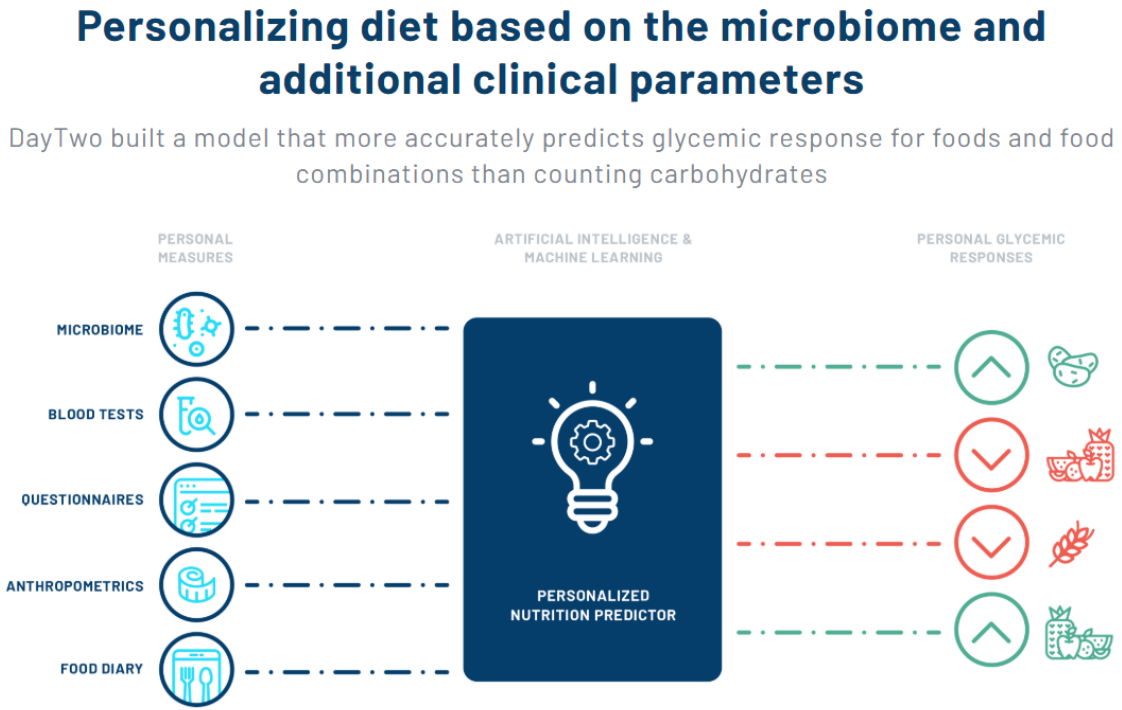


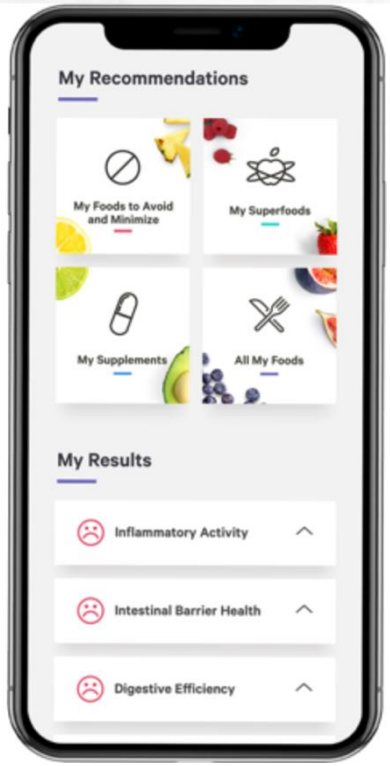


Sources: www.cbc.ca; https://www.prnewswire.com/news-releases/the-global-probiotics-market-size-is-expected-to-reach-73-8-billion-by-2024--rising-at-a-market-growth-of-7-7-cagr-during-the-forecast-period-300850278.html; sungenomics.com; https://www.transparencymarketresearch.com/human-microbiome-market.html; bluebiology.com

Market growth is being fueled by an aging population, increasing incidence of lifestyle diseases, and technological advances.

- Advances in genomics and sequencing technologies are making microbiome-testing more accessible and fueling the development of diagnostic and therapeutic applications.
- Companies such as DayTwo and Viome provide home testing kits to develop genetic profiles of an individual's gut microbiome, and then provide personalized nutrition planning based on the results.





Sources: www.daytwo.com; viome,com

Current jobs are predominantly in higher education, life sciences, and health care, but jobs in other fields such as supply chain and marketing are emerging.

- Most jobs require advanced degrees and specialized training and skills, including informatics and data science.

Bioinformatician
OraSure Technologies, Inc. 3.2 ★
Saint Paul, MN 55114 (St. Anthony area)

- Analysis of microbiome data for unique and specialized projects.
- Multi-omics approaches including genomic, metabolomic and microbiome data (amongst others).

Microbiologist, Gene Editing
Commonwealth Sciences
Bedford, MA

- Previous experience working with microbiome is highly desired.

Genomics Lab Technologist
OraSure Technologies, Inc. 3.2 ★
Saint Paul, MN 55114 (St. Anthony area)

- This position will involve carrying out microbiome sample processing and other laboratory experiments under the direction of CoreBiome scientists.

Professor
Penn State University 4.3 ★
Hershey, PA

- Applicants must have NIH R01 grant funding and have a research interest in gut microbiome.
- The Department of Medicine, Division of Gastroenterology, at The Penn...

Associate Director/Director, Supply Chain
Seres Therapeutics, Inc.
Cambridge, MA 02139

- You will lead a dynamic team focused on supporting the manufacturing and distribution of microbiome therapeutics through procurement, warehousing, and logistics...

Donation Operations Technician
Seres Therapeutics, Inc.
Cambridge, MA 02139 (Cambridgeport area)

- The technician is responsible for laboratory assays to examine and characterize donor microbiomes.

Source: indeed.com

Colleges and universities play a major role in research.

- **Baylor University's** Alkek Center for Metagenomics and Microbiome Research was part of the Human Microbiome Project.
- **University of California San Diego** has a Center for Microbiome Innovation.
  - Graduate programs in Biomedical Science include training areas in Microbiome and Microbial Sciences.
- **Northern Arizona University's** Pathogen and Microbiome Institute (PMI) employs over 100 faculty, full time staff, and graduate and undergraduate students. Microbiome research focuses on "the role of the microbiome in chronic healthcare challenges."
- **The University of Michigan** Microbiome Project is a research program "dedicated to the engineering of microbiomes for the benefit of human health."
- **Stanford University** hosts The Center for Human Microbiome Studies which conducts research and translate the findings to "provide therapies, inform medical practice, and inform dietary and lifestyle habits."

Sources: http://cmi.ucsd.edu/; https://www.forbes.com/sites/quora/2018/12/03/why-you-should-be-paying-more-attention-to-your-gut-microbiome/#10adb877235c; https://nau.edu/pmi/; Source: https://www.coursera.org/learn/microbiome; edx.org; https://www.classcentral.com/course/food-and-mood-17020

Institutions are starting to develop courses on the microbiome.

Browse > Health > Basic Science

Gut Check: Exploring Your Microbiome

★★★★½ 4.7 683 ratings • 199 reviews

Offered By

UNIVERSITY OF COLORADO BOULDER

UNIVERSITY OF CALIFORNIA SAN DIEGO

Enroll for Free

Starts Jan 08

Financial aid available

55,174 already enrolled!

Nutrition and Health: Human Microbiome

Learn how you can impact your health by balancing your gut health; how your microbiome together with your diet can improve normal gut function. A balanced microbiome and nutritional intake can avoid disorders like IBS, obesity and diabetes.



WAGENINGEN UNIVERSITY & RESEARCH

more dates

28,896 already enrolled!

Enroll

Started Nov 5, 2019

I would like to receive email from WageningenX and learn about other offerings related to Nutrition and Health: Human Microbiome.

Sources: http://cmi.ucsd.edu/; https://www.forbes.com/sites/quora/2018/12/03/why-you-should-be-paying-more-attention-to-your-gut-microbiome/#10adb877235c; https://nau.edu/pmi/; Source: https://www.coursera.org/learn/microbiome; edx.org; https://www.classcentral.com/course/food-and-mood-17020

CANNABIS



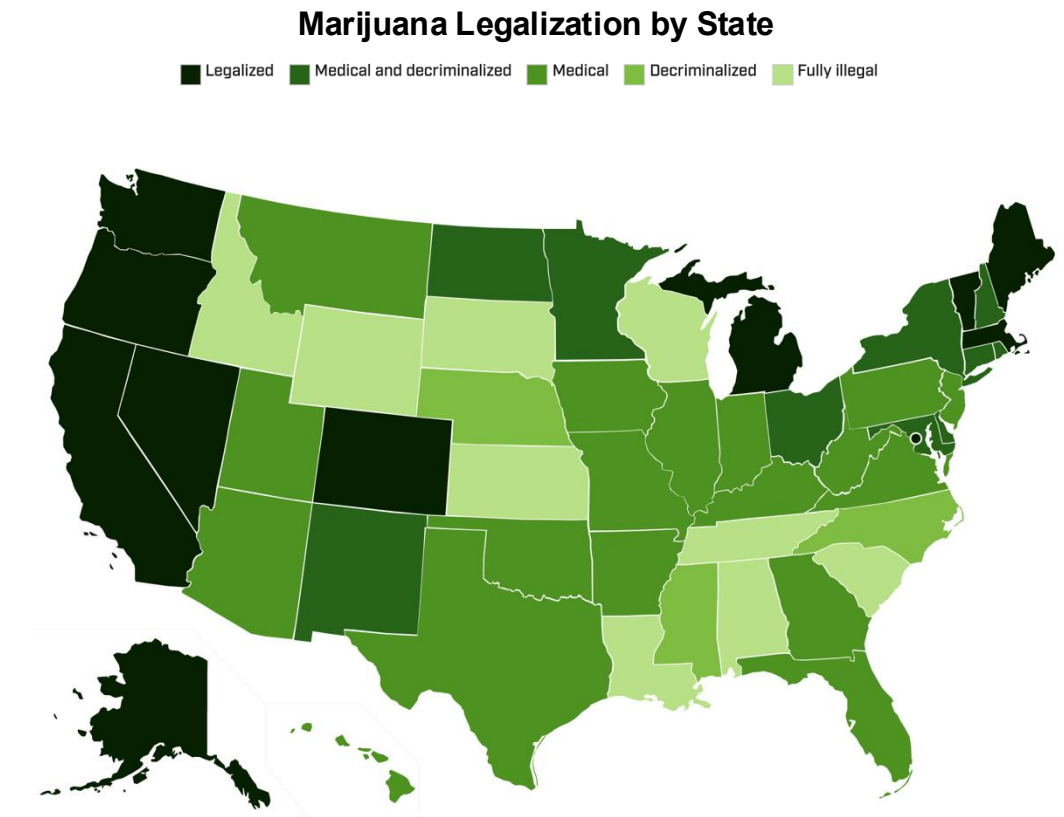
"Something that once could have gotten students in big legal trouble at college may now be a budding career path."

"We ran out of seats before half of the university could register for the course"

Source: https://www.nbcnews.com/news/us-news/univ-connecticut-offer-course-marijuana-industry-budding-career-path-n946721

Public and legislative support for the legalization of marijuana is growing.

- 67% of Americans now support the legalization of marijuana, up from 32% in 2010, and just 18% in 1990.
- Marijuana is legal for **recreational use** in 11 states* and Washington, DC.
- 33 states have legalized marijuana for **medical** use.*
  - An additional 14 states have legalized limited THC content for products such as CBD oil.
- Cannabis remains illegal under federal law, but the Rohrabacher–Farr amendment prohibits federal prosecution of individuals complying with state medical cannabis laws.
- Marijuana was legalized throughout Canada in 2018.



*As of December 2019; legalization in Illinois is effective January 2020.

Sources: https://disa.com/map-of-marijuana-legality-by-state ; https://www.businessinsider.com/legal-marijuana-states-2018-1; https://en.wikipedia.org/wiki/Legality_of_cannabis_by_U.S._jurisdiction; https://www.pewresearch.org/fact-tank/2019/11/14/americans-support-marijuana-legalization/

Growing Like a Weed

The North American market for legal marijuana is expected to top **$16 billion** in 2019.

- The market is predicted to grow to **$47 billion** by 2027, and possibly **$80 billion** by 2030.
- CBD (cannabidiol), which is used in oils, oral sprays, creams, pills, and edibles, is one of the fastest-growing segments; sales are predicted to reach anywhere from $1.3 to $22 billion by 2022.
- Marijuana companies raised **$13.8 billion** in funding in 2018, 4X the amount raised in 2017.
- The U.S. marijuana industry is forecast to generate **$17.5 billion** in tax revenue by 2030.



Source: https://apnews.com/0bd3cdbae26c4f99be359d6fe32f0d49

- Banking remains a key legal obstacle, but blockchain-based transactions and record-keeping, such as those offered by **Mtrac**, may provide a compliant solution.
- Prominent companies include software provider **Green Bits**, robotics firm **Bloom Automation**, multistate operators **Cresco Labs** and **Green Thumb Industries,** delivery companies **Eaze and Dutchie,** and **CannaCloud,** the "Keurig" for cannabis.

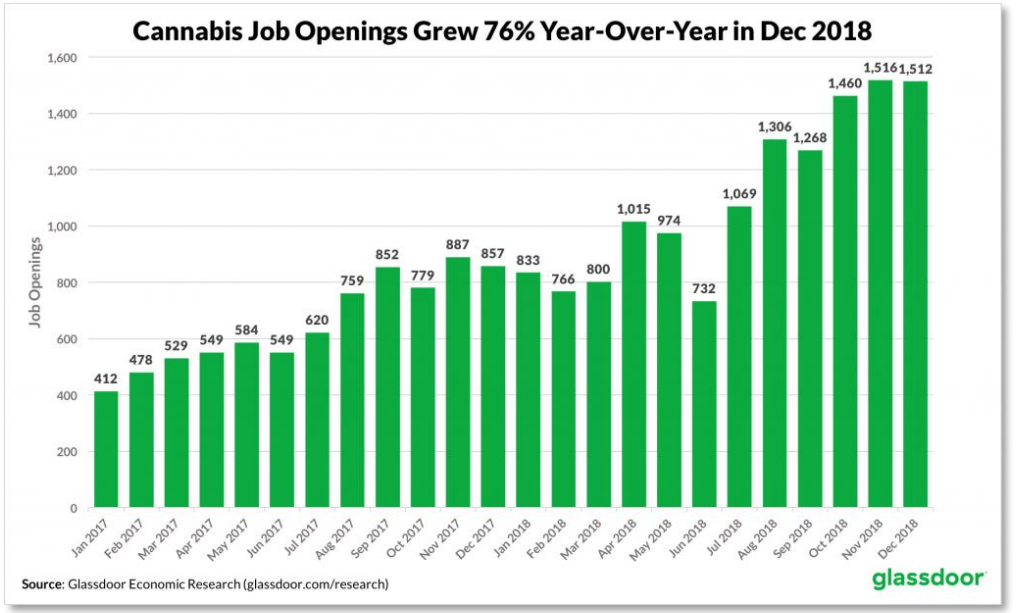
Sources: https://www.investopedia.com/articles/investing/111015/future-marijuana-industry-america.asp; https://markets.businessinsider.com/news/stocks/weed-us-marijuana-industry-facts-2019-5-1028177375; https://apnews.com/0bd3cdbae26c4f99be359d6fe32f0d49; https://www.cnbc.com/2019/01/08/top-weed-analyst-on-wall-street-raises-sales-forecast-names-top-picks.html

Cannabis employs more Americans than coal.

- *New Frontier Data* estimates U.S. employment in the cannabis industry at **250,000** (jobs directly involved in handling marijuana plants). Employment could reach 414,000 workers by 2021.
  - This excludes additional jobs that don't involve direct work with the plants but are harder to quantify.

- **Marijuana pays more:** Glassdoor cites a median industry salary of **$58,511**, compared to $52,863 for U.S. workers as a whole - a difference of more than 10%.
- The market is still localized due to regulatory and legal considerations. The top three metro areas for cannabis job openings are **San Francisco, Los Angeles**, and **Denver**.
- Small-to-medium sized businesses (<500 employees) accounted for 84% of job openings.

Double-Digit Employment Growth



Sources: https://apnews.com/0bd3cdbae26c4f99be359d6fe32f0d49; https://www.glassdoor.com/research/cannabis-talent-heats-up/

Employment is largely divided into three segments: service and retail, professional and technical, and labor and physical.

- Some jobs are entry-level positions common to many industries, such as delivery people, pickers, and cashiers; pay typically ranges from $20,000-$40,000.
- Other jobs require advanced degrees or specialized skills and can pay upwards of $100,000.

Master Grower, Botanical Specialist



- Oversee plant cultivation
- Degree or experience in agriculture, botany, horticulture

Dispensary Manager, CEO



- Manage retail dispensaries
- Business degree, retail management experience, CPA

Extraction Technician, Master Extractor



- Laboratory extraction of THC, CBD
- Degree in chemistry, biochemistry, engineering, natural sciences

Edibles Chef



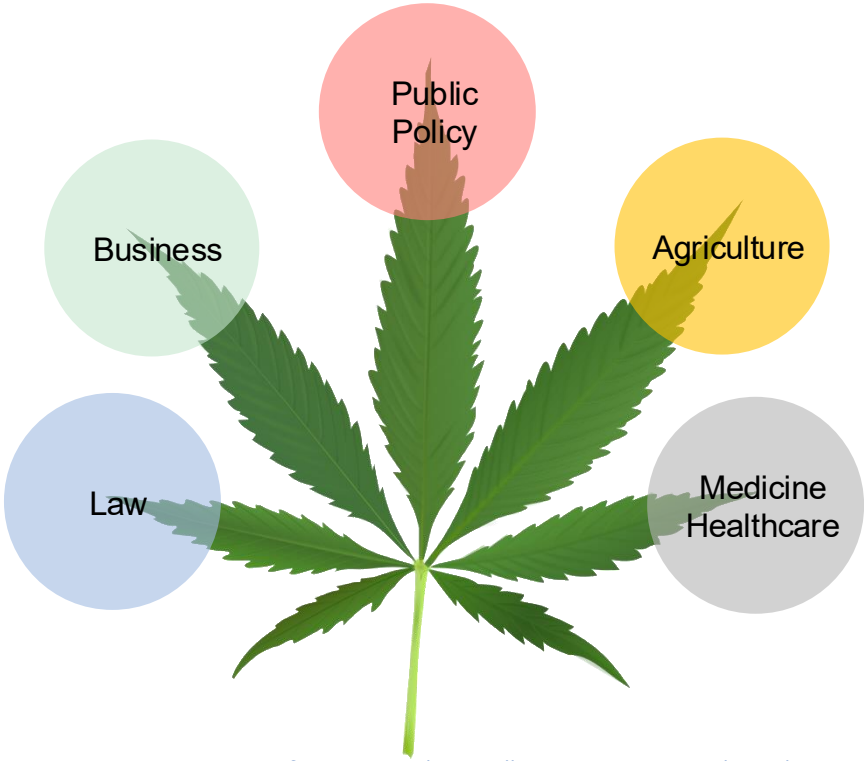
- Develop, create, oversee production of marijuana edibles
- Culinary degree or training

Sources: https://www.investopedia.com/personal-finance/5-highpaying-jobs-marijuana-industry/; https://www.trade-schools.net/articles/cannabis-jobs.asp; https://money.cnn.com/2017/11/04/pf/jobs/pot-jobs/index.html?iid=EL

Cannabis is gaining traction in higher education with courses, programs, and research.

- **Multidisciplinary:** Cannabis-related courses and programs have been launched in fields such as business, medicine, public policy, chemistry, and lab sciences.
- **Research: UC-Berkeley** opened a Cannabis Research Center in January 2019 to study the impact of cannabis production on the environment and society. The **University of Vermont**'s Medical Cannabis Center for Research and Education focuses on research and clinical applications of cannabis-based medicine for therapeutic use.

- Programs and training courses are offered by non-accredited institutions such as Oaksterdam University, Cannabis Training University, and Clover Leaf University.
- Uncertainties remain; legal concerns led the University of Maryland to cancel plans for a training program for pharmacists and technicians working in medical marijuana dispensaries.
  - The University has since launched the program online.



Sources: https://news.berkeley.edu/2019/01/29/new-cannabis-research-center-to-explore-environmental-social-impacts-of-legalization/; https://www.nbcnews.com/news/us-news/univ-connecticut-offer-course-marijuana-industry-budding-career-path-n946721

New Program Announcements

GRAYASSOCIATES

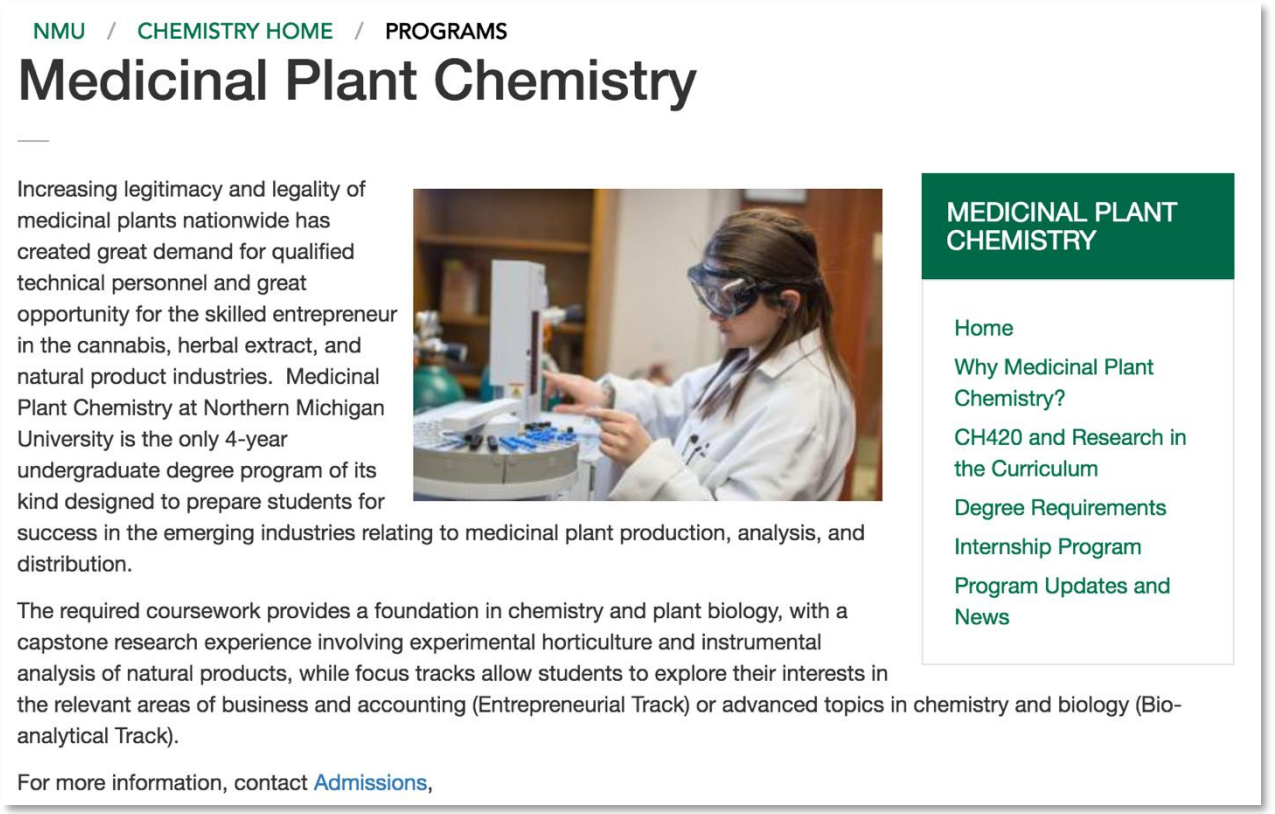
More than 10 new programs were announced in 2018 and 2019, including some at public institutions.

Institution	Program	Degree Level	Year
Northern Michigan University (MI)	Medicinal Plant Chemistry	Bachelor's degree	2017
Thomas Jefferson University (PA)	Cannabinoid Pharmacology	Graduate Certificate	2018
	Cannabis Medicine	Graduate Certificate	2018
	Cannabinoid Chemistry & Toxicology	Graduate Certificate	2019
Clark University (MA)	Marijuana Regulation	Graduate Certificate	2019
Florida Gulf Coast Univ (FL)	Cannabis Studies	Bachelor's degree	2019
Hocking College (OH)	Cannabis Lab Technician	Associate degree	2019
Lackawanna College (PA)	Cannabis Business Development	Undergrad certificate	2019
Lake Superior State University (MI)	Cannabis Science	Associate degree	2019
	Cannabis Chemistry	Bachelor's degree	2019
	Cannabis Business	Bachelor's degree	2019
Oakton Community College (IL)	Medical Marijuana (Cannabis Dispensary and Patient Care Specialist)	Undergrad certificate	2019
University of Maryland School of Pharmacy (MD)	Medical Cannabis Science and Therapeutics	Master's	2019

Source: Gray Associates New Program Announcement database

Northern Michigan University: Bachelor of Science, Medicinal Plant Chemistry.

- Launched in fall 2017, the program combines chemistry, biology, botany, horticulture, marketing, and finance.
- Available concentrations include Entrepreneurial Track and Bio-analytical Track.
- The inaugural cohort was 12 students, and the university anticipates rapid growth.
- Graduates will be qualified to be analysts in a lab setting and could earn as much as $70,000 directly out of school.



NMU / CHEMISTRY HOME / PROGRAMS

Medicinal Plant Chemistry

Increasing legitimacy and legality of medicinal plants nationwide has created great demand for qualified technical personnel and great opportunity for the skilled entrepreneur in the cannabis, herbal extract, and natural product industries. Medicinal Plant Chemistry at Northern Michigan University is the only 4-year undergraduate degree program of its kind designed to prepare students for success in the emerging industries relating to medicinal plant production, analysis, and distribution.

MEDICINAL PLANT CHEMISTRY

- Home
- Why Medicinal Plant Chemistry?
- CH420 and Research in the Curriculum
- Degree Requirements
- Internship Program
- Program Updates and News

The required coursework provides a foundation in chemistry and plant biology, with a capstone research experience involving experimental horticulture and instrumental analysis of natural products, while focus tracks allow students to explore their interests in the relevant areas of business and accounting (Entrepreneurial Track) or advanced topics in chemistry and biology (Bio-analytical Track).

For more information, contact Admissions,

Sources: https://www.nmu.edu/chemistry/medicinal-plant-chemistry; https://www.usatoday.com/story/news/nation-now/2017/10/09/marijuana-degree-northern-michigan-university/745964001/; https://www.cnbc.com/2018/04/20/you-can-make-70000-out-of-college-with-a-degree-in-marijuana-studies.html

Lake Superior State University launched two cannabis-related bachelor's programs.

BS, Cannabis Business

- Launched in fall 2019 through the Lukenda School of Business
- The program focuses on business management principles specific to cannabis industry functions and operations.
- Curriculum includes common business core and classes such as Cannabis Business Policy and Cannabis Economics.
- Graduates are prepared for jobs as managers, supervisors, and business developers within a commercial cannabis enterprise.

$62,500

Average Starting Salary (Vangst 2018 Salary Guide)

BS/AAS, Cannabis Chemistry

- Launched in fall 2019. First U.S. program focused on quantitative analysis of cannabis-related compounds and contaminants (e.g., THC, CBD, and terpenes).
- Bachelor's and associate degree options.
- Prepares graduates for jobs as:
  - Bio/Analytical Chemist
  - Cannabis Extraction Manage/Technician
  - Clinical Chemist
  - Field Application Scientist
  - Food Safety and Quality Assurance Chemist
  - Formulation/Process Development Scientist
  - Laboratory Manager/Technician
  - Pharmaceutical Chemist
  - Research/Process Development Scientist
  - Toxicology/Risk Assessment Scientist

Sources: https://www.lssu.edu; https://www.lenconnect.com/news/20190315/lssu-launches-cannabis-business-degree-program

Clark University, Graduate Certificate in Regulatory Affairs for Cannabis Control

- Launched in fall 2019, the program is offered through the School of Professional Studies and focuses on policy rather than business.

- The program consists of three online courses which can be completed in two semesters:
  - Cannabis Education and Enforcement
  - Regulatory Frameworks for Cannabis Control
  - Health and Public Safety Implications of Cannabis Use

- Each course costs about $2,800; credits can be applied toward a Master of Public Administration.

CLARK UNIVERSITY

Learn strategies to address complex issues germane to legalization of cannabis and develop the knowledge, confidence, and skills needed to implement solutions.

Certificate holders will attain:

- An understanding of the intersection and influences of social, medical, economic and legal viewpoints on cannabis use monitoring and control.
- Insight on best practices and expertise to educate the public on the health and safety risks associated with cannabis use.
- Ability to act as an informed leader to ensure the safety and health of the various public administration constituencies.
- A demonstrated knowledge of the regulatory bodies involved in oversight of the cannabis supply chain, including public health officials, tax bureau, and law enforcement.

Sources: https://www.clarku.edu/academics/graduate/programs/certificate/certificate-in-regulatory-affairs-for-cannabis-control-online/; https://patch.com/massachusetts/worcester/clark-u-offer-graduate-certificate-marijuana-regulation

Hocking College: AAS, Laboratory Science - Cannabis Laboratory major

- The program was announced for fall 2019 and consists of 62 credit hours.
- Tuition and fees: $15,713 (in-state) and $24,493 (out-of-state)



Key Program Features: Small class sizes, state-of-the-art laboratory, and professional opportunities.

The Cannabis Lab Technician program at Hocking College is the first Associate Degree in Laboratory Sciences with a major in Cannabis Laboratory in the United States.

Students will be learning cannabis specific tests and techniques while spending a significant amount of hands-on training with the same analytical instruments found in other commercial labs. The lab will allow for on-site processing operations, as well as analytical testing.

Get Your Career Started at Hocking College

Hocking College has been awarded a provisional license to be one of two educational institutions that will serve as a Medical Cannabis testing lab for the State of Ohio, meaning you will learn in a state-of-the-art facility.

Additionally, this program is the only one in the nation that provides hands-on technical training for those seeking to work in medical cannabis quality assurance labs.

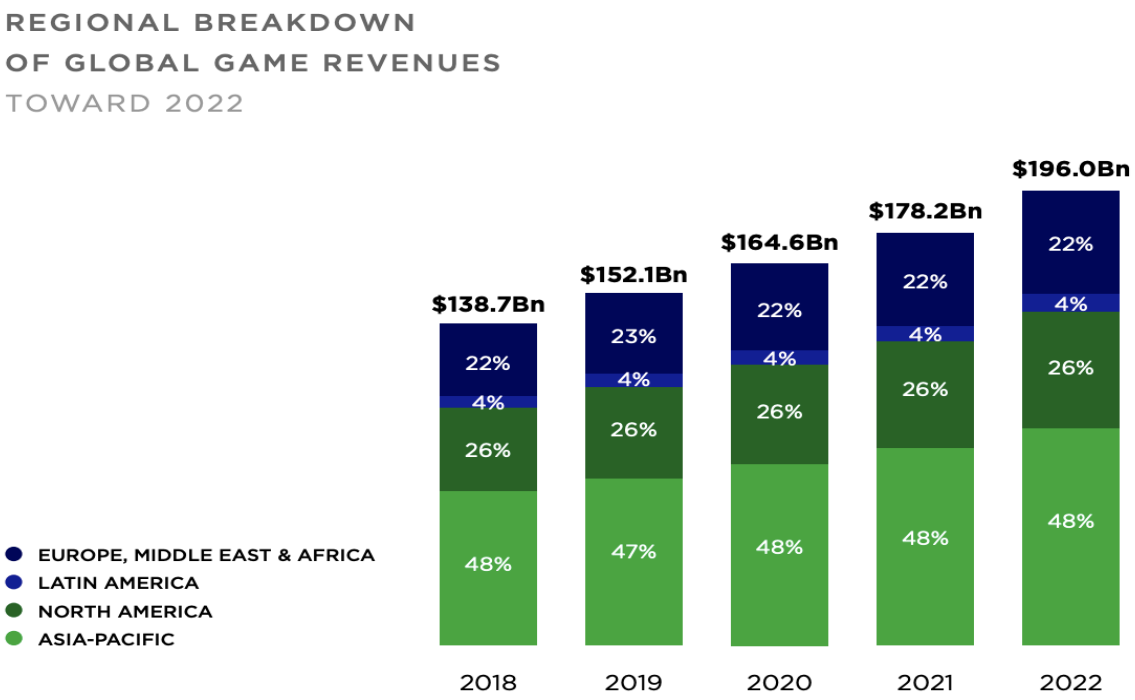
After successful completion of this first year of general education classes, students will then be exposed to more technical aspects of operating an analytic lab.

Source: https://www.hocking.edu/laboratory-sciences

ESPORTS



Esports is driving the Video Game Industry to new heights and rapid growth.



- In 2019, the Video game industry was bigger than the Movies, Music, NFL, MLB, NBA and NHL industries combined!
- Sources:https://resources.newzoo.com/hubfs/Reports/2019_Free_Global_Game_Market_Report.pdf?utm_campaign=Games%20Market%20Report%20Launch%202019&utm_medium=email&_hsenc=p2ANqtz-9sQlmKzGYkMcwcmTs1IBLxMeMzUSuxwBGiuPWLNnYUwvHFQuSOnjPJ3zvLrndrIKnMdTr1byeJavqQrrrKIJ_2ZrpEDVTLUgEBxZ7tmDS3nbpoqY0&_hsmi=73791428&utm_content=73791551&utm_source=hs_email&hsCtaTracking=66a17bfe-afc4-4025-8fa5-fcaa34aa2d01%7Cfada6032-5faa-41e6-bef3-c9143d3bfe8b

Esports: What is it?

GRAYASSOCIATES

Esports, or electronic sports, is professional competitive video gaming.

- Esports operates much like traditional sports, with leagues based on popular games, such as Fortnite, League of Legends, and Call of Duty.
- Gamers and esports teams compete at organized tournaments and online.
- Watched by million of fans in-person, on television, or through streaming services such as Twitch.
- Successful gamers have loyal "fandoms" and can earn millions.



Lionel Bonaventure | AFP | Getty Images

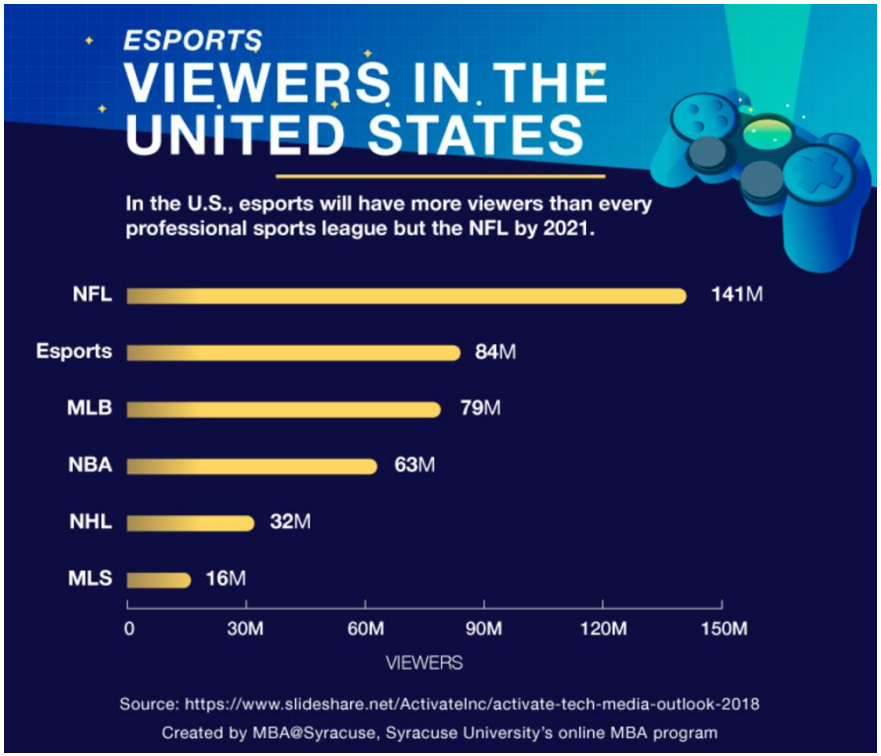
- Major players include streaming service Twitch, gaming companies such as Activision Blizzard and Tencent, and teams and organizations such as Team Liquid and Cloud9.
- Some industry enthusiasts predict esports will become an Olympic sport.

> *"The world of competitive video gaming is a fast-growing international phenomenon with millions of fans and billions of dollars up for grabs." - CNN*

Sources: https://www.cnn.com/2018/08/27/us/esports-what-is-video-game-professional-league-madden-trnd/index.html; https://www.su.edu/esports/; https://www.businessinsider.com/complexity-gaming-opens-new-headquarters-on-dallas-cowboys-campus-2019-5; https://onlinebusiness.syr.edu/blog/esports-to-compete-with-traditional-sports/

Viewership of esports rivals that of major league sports and may grow even bigger.

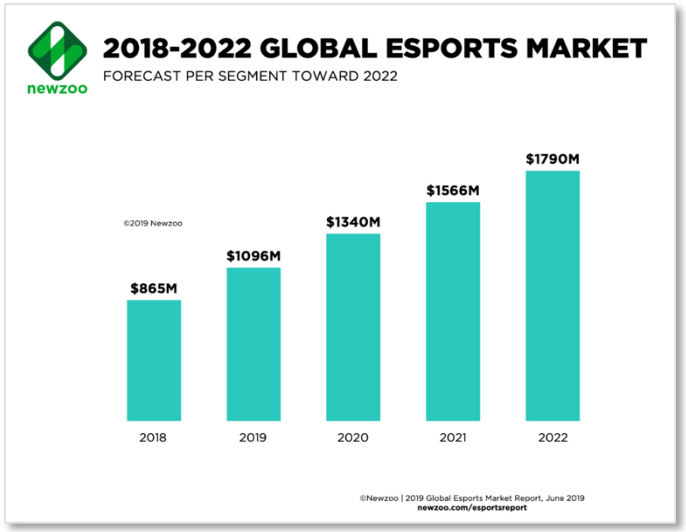
- Worldwide audience of **454 million** people.
- More people watched the League of Legends World Championship finals than the Super Bowl.
- Esports viewership could rival or surpass all professional sports leagues by 2021.
- In fact, traditional sports franchises are getting into the game:
  - The NBA launched its own eSports league around the NBA 2K game franchise, complete with a draft.
  - Dallas Cowboys owner Jerry Jones purchased a majority stake in Complexity Gaming.
  - The New York Yankees entered a partnership with Vision Esports, an esports investment firm.

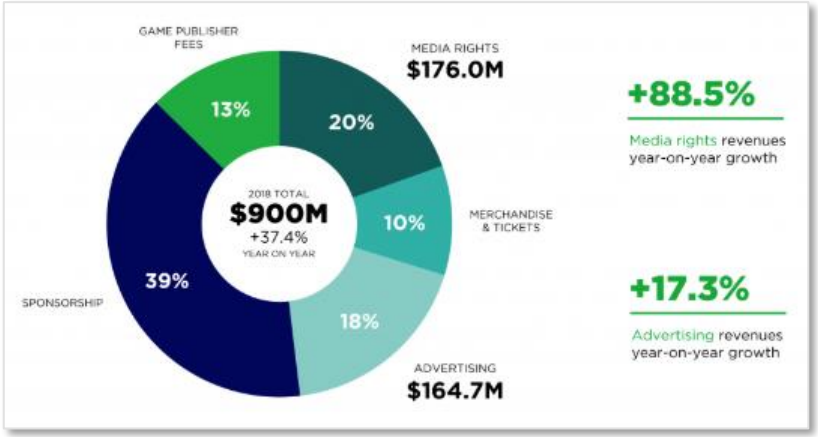


Source: https://newzoo.com/insights/articles/newzoo-global-esports-economy-will-top-1-billion-for-the-first-time-in-2019/; https://www.su.edu/esports/; https://www.cnbc.com/2019/04/14/league-of-legends-gets-more-viewers-than-super-bowlwhats-coming-next.html; https://onlinebusiness.syr.edu/blog/esports-to-compete-with-traditional-sports/

The global esports market is expected to reach $1.1 billion in 2019 and grow to $1.8 billion by 2022.

- Sponsorships generate the most revenue.
- Media rights are the fastest-growing segment.
- North America is the largest geographic market; China is second.
- Franchise values are rising:
  - League of Legends franchises sold for $10 million in 2017; by 2018 they were valued at $50 million.
  - Overwatch franchise valuations rose from $20 billion in 2017 to an estimated $60-$80 million in 2018.





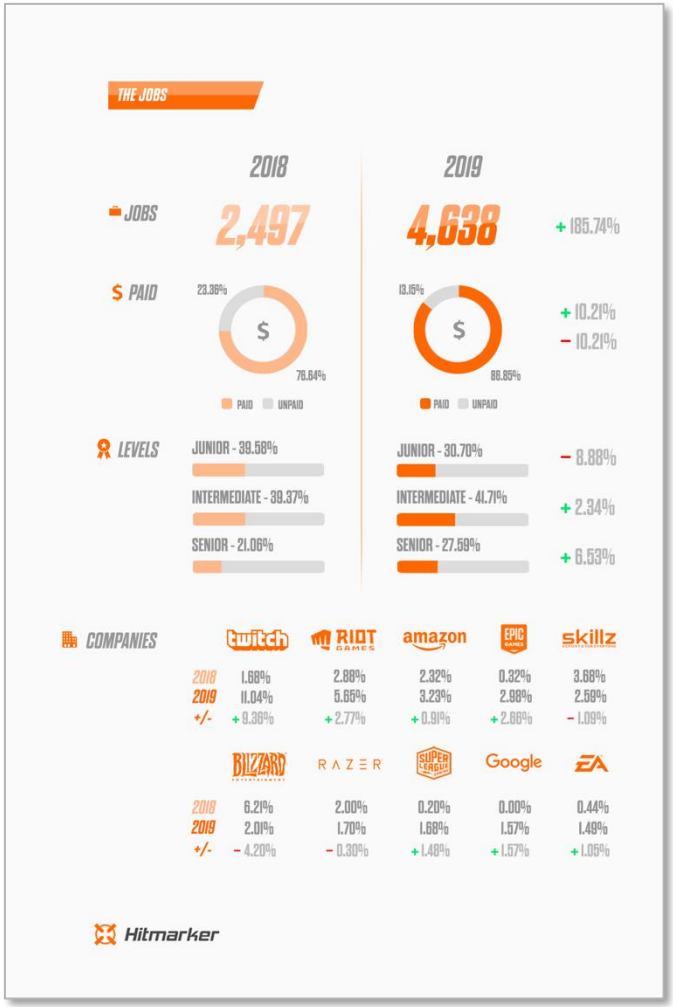
Source: https://newzoo.com/insights/articles/newzoo-global-esports-economy-will-top-1-billion-for-the-first-time-in-2019/; https://www.su.edu/esports/; https://www.cnbc.com/2019/04/14/league-of-legends-gets-more-viewers-than-super-bowlwhats-coming-next.html; https://www.forbes.com/sites/mikeozanian/2018/10/23/the-worlds-most-valuable-esports-companies-1/#4eb56b3a6a6e

The number of esports jobs is modest but growing rapidly; these jobs involve a range of occupations and skills.

- Hitmarker hosts an Esports job board.
  - 4,600+ jobs in the first half of 2019, up over 2,000 jobs YoY.
  - 20% are for management and marketing positions.

- Glassdoor listed 1,303 esports jobs in December 2019 including:
  - Data Analyst, esports Manager (Amazon)
  - Director – Client Strategy (Twitch)
  - Director of Esports (Epic Games)
  - Associate Esports Producer, Esports Broadcast Producer (Microsoft)
  - Marketing Projects Manager (Golden State Warriors)
  - Coordinator of Campus Life – eSports (Illinois Institute of Technology)
  - Analyst - League of Legends (Team Liquid)

"This is a world that needs a workforce. And those involved in the industry can be well-compensated."
– Shenendoah University Esports program website



Sources: Glassdoor.com; https://venturebeat.com/2018/08/30/esports-is-hiring-and-you-dont-need-to-be-a-player/; https://www.su.edu/esports/; Shenendoah University esports website: su.edu/esports; https://esportsinsider.com/2019/07/esports-jobs-growth-2019/; hitmarkerjobs.com

Esports in higher education is evolving from an activity to a field of study.

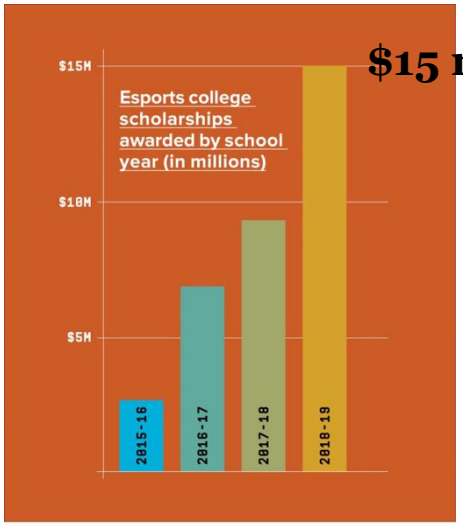
Varsity Teams

UTAH ESPORTS

Facilities



Scholarships



Source: National Association of Collegiate Esports

$15 million

Programs



Sources: Gray Associates New Program Announcement database: http://fortune.com/2018/08/17/this-school-is-cutting-80-degree-programs-while-building-the-worlds-largest-e-sports-facility/; https://nacesports.org/; https://www.scholarships.com/financial-aid/college-scholarships/sports-scholarships/esports-scholarships-scholarships-for-gamers/; https://nacesports.org/about/ https://www.insidehighered.com/news/2017/06/09/esports-quickly-expanding-colleges; https://www.wired.com/story/infoporn-college-esports-players-cashing-in-big/

Becker College, Bachelor of Science in Esports Management

- Launched in fall 2018, Becker was the first institution to offer an esports degree program.
- The program is housed in the School of Design & Technology.
- The curriculum includes courses in business, marketing, game design, economics, psychology, supply chain, accounting, finance, and event management.

Bachelor of Science in Esports Management

The Bachelor of Science in Esports Management focuses on the business side of this fast-growing industry. The global esports industry is growing at a rate of 40% a year and is expected to top $1.5 billion dollars (US) in revenue by 2020 and a global audience of over 580 million. With growth comes opportunities in the form of demand for professionals with the right mix of education, passion, and experience. Students learn how to plan and execute small and large scale events utilizing the latest in streaming technology, develop business plans to develop teams, create online communities, and promote events through digital technology. Students will also explore the culture of esports, its audience and fan base, and four dominant game genres that make up the industry. Students will be taught through traditional face-to-face to classes with a potential for hybrid classes, for appropriate courses.



Source: https://www.becker.edu

Caldwell University, B.S. in E-Sports Management

- In fall 2019, Caldwell launched a Bachelor of Science in eSports Management through the School of Business and Computer Science.
- The program focuses on the business and sport side of the industry and include courses on digital marketing, esports management, entrepreneurial studies, event planning, operations, ethics, and the sociological impact of esports.
- Major requirements: Liberal Arts and Sciences Core - 49 credits, Major in E-Sports Management - 60 credits, Open Electives - 11 credits



Sources: https://www.caldwell.edu/academics/majors-minors/business/b-s-in-e-sports-management

Shenandoah University Bachelor of Science in Esports

- The degree program was launched in fall 2019 and has two available tracks:
  - Esports Management
  - Esports Media & Communications
- Additional eSports options include minors in Esports Management and Esports Performance Studies, and an online certificate in Esports Performance Studies.
- Shenandoah also hosts an eSports varsity team that competes through the National Association of Collegiate Esports

> **We are working to prepare students to enter this field as highly qualified individuals with a unique bachelor's degree that will place them ahead of other people wishing to enter the field. Shenandoah has positioned itself at the forefront of the esports industry by offering students an environment to participate in and study esports in a number of different ways."**
>
> **Joey Gawrysiak, Ph.D.**



Core eSports Courses

- Introduction to Esports
- Contemporary Issues in Esports
- Esports Performance; Esports Ergogenic Aids
- Esports Physical Training
- Injuries & Rehabilitation
- Esports Consumerism
- Esports Structure and Governance
- Esports Event Management
- Experiential Learning

Sources: https://www.su.edu/esports/

The Ohio State University has a varsity esports team, is building an arena, launching a program, and conducting research on esports.

- **Academics:** OSU is developing undergraduate and graduate esports programs, with multidisciplinary curricula focused on esports management, game art and production, game design, programming, the business of games, and health and rehabilitation.
  - "This is a business curriculum. This is an engineering curriculum. This is a communications curriculum. This is a curriculum that will touch areas that all of us will benefit from and never realize that it started in e-gaming and esports." – Bruce McPheron, Provost, The Ohio State University
- **Facilities:** The university built an esports arena with over 80 gaming stations and a broadcast booth for "shoutcasting".
- **Research:** Researchers at OSU's **Wexner Medical Center** are studying esports from the perspective of human performance and data analytics:
  - "Ohio State is already ahead of the curve in studying the connection between machine learning and human learning. This provides us with a springboard to delve deeper into the understanding of human performance in esports." – Morley Stone, Senior Vice President for Research
  - "Ohio State is known for high-performance athletics, and esports plays to this strength. The methods are the same as any other sport – the skills are just different. We have a lot to learn from studying esports athletes, from their exceptional reaction times and rapid decision-making abilities to their physical attributes and health behaviours." - James Onate, Co-director of the Sports Medicine Movement Analysis and Performance Program

Sources: https://news.osu.edu/the-ohio-state-university-launches-first-of-its-kind-comprehensive-esports-program/; https://esportsinsider.com/2018/10/ohio-state-university-establishes-esports-program-research/ ; https://www.npr.org/2019/10/27/773817348/major-in-esports-at-ohio-state

THE OHIO STATE UNIVERSITY

Why it makes sense to launch an Esports program.

- Many of the courses needed are already offered
- New Esports courses could bolster current programs by becoming electives.
- This program would not only launch careers in Esports it would also open up doors to many other lucrative careers.
- Could help to increase male enrollment.
  - 32% of all gamers are men ages 10-35
- Low competition
- Increasing Student Demand
- Exploding employment growth

"The fan base is huge and so passionate about their favorite games, teams and players. I would be crazy not to get involved, Hell I would have studied this at LSU"

Shaquille O'Neal
NRG Sports Investor

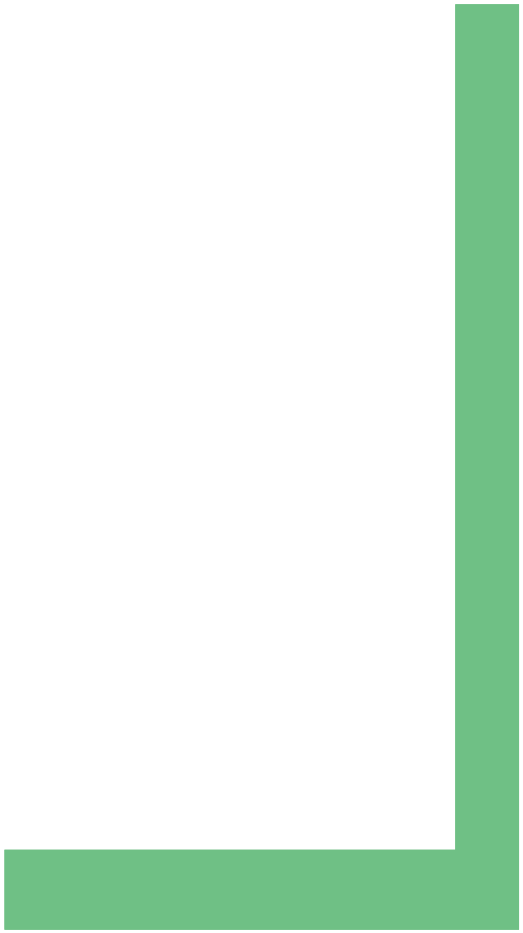
Source: https://www.thescoreesports.com/lol/news/10506-shaq-on-entering-esports-the-fan-base-is-huge-and-so-passionate-about-their-favorite-games-teams-and-players:

Upcoming Webinars

Webinar Topic	Date
GrayReports: Monthly Demand Trends Webcast	January 23, 2:00 pm ET



I. CUTS



MIT xPro has a two-course program: Quantum Computing Fundamentals



Quantum Computing Fundamentals

Price: $2,149

Number of Courses: 2

Duration: 4 weeks per course

Next Start Date: January 13, 2020

WHAT YOU WILL LEARN

Discover the business and technical implications of the new frontier in computing and how you can apply them to your organization with this two-course program from MIT.

- Describe one substantial difference between quantum and classical computation.
- Assess at least one potential business application for quantum computation.
- Understand engineering challenges currently faced by developers of real quantum computers.
- Evaluate one key technology requirement for quantum computers to be able to function properly.
- Become comfortable with the mathematical description of quantum states and basic quantum operations.
- Discern potential performance gains enabled by quantum algorithms, over classical algorithms, for cybersecurity, chemistry, and optimization.
- Gain proficiency with the engineering requirements for implementing quantum vs classical algorithms.
- Familiarize yourself with scientific limits faced by quantum algorithms for chemistry and optimization.
- Summarize the technology requirements for quantum computers to be able to run realistically large quantum algorithms.



Introduction to Quantum Computing

Course 1 of 2 in the Quantum Computing Fundamentals online program

VIEW DETAIL



Quantum Computing Algorithms for Cybersecurity, Chemistry, and Optimization

Course 2 of 2 in the Quantum Computing Fundamentals online program

VIEW DETAIL

Source: https://xpro.mit.edu/programs/program-v1:xPRO+QCF+R5/

Sample of Udemy courses.



QC101 Quantum Computing & Quantum Physics for Beginners

BESTSELLER 105 lectures • 3.5 hours • All Levels

Master **Quantum Computing**, **Quantum** Cryptography, and **Quantum** Physics with Microsoft Q# (Q Sharp) & IBM **Quantum** Experience | By Kumaresan Ramanathan



QC051: Math Prerequisites for Quantum Computing

HIGHEST RATED 113 lectures • 4 hours • Beginner

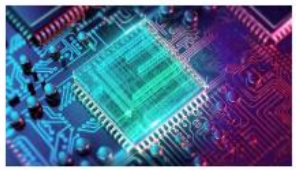
Review of Basic Math prerequisites for **Quantum Computing** & **Quantum** Physics | By Kumaresan Ramanathan



QC151 Quantum Physics for Quantum Computing

BESTSELLER 37 lectures • 1.5 hours • Beginner

Non-mathematical coverage of Superposition and Entanglement. Intuitive & qualitative preparation for advanced topics | By Kumaresan Ramanathan



Quantum Computing - An Overview

10 lectures • 1.5 hours • Beginner

A detailed overview of **Quantum Computing** covering Entanglement, Superposition, **Quantum** Gates, Superdense Coding | By Lakshmy Subramonia Iyer



Fundamentals of Cloud Computing and Quantum Computing

HIGHEST RATED 33 lectures • 3 hours • All Levels

Learn the Core Concepts of Cloud **Computing** and **Quantum Computing** | By Dave L.



Quantum Computing: Theory to Simulation and Programming

29 lectures • 4 hours • All Levels

Understand the Fundamentals of a **Quantum** Computer and the DWave framework. Solve tasks on a real **Quantum** Computer | By Vinay Phadnis

Autonomous Vehicles: Market

GRAYASSOCIATES

The global autonomous vehicle market was estimated at **$54.23 billion** in 2019; it could grow to $556.67 billion by 2026.

- Widespread adoption could revolutionize the way we travel and work but faces significant obstacles.

Applications

- Personal and public transportation
- Freight transportation
- Consumer deliveries
- Military operations
- Security/Surveillance
- Safety (shielding humans from dangerous tasks)
- Exploration/scientific discovery/data collection
- 3D mapping/aerial imaging/videography
- Signal emission/remote internet access



Obstacles

- Technology
- Safety
- Affordability
- Regulations
- Infrastructure
- Cybersecurity
- Consumer Acceptance

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(IMAGES)
2. CHALLENG
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PAGE)

Ruffling feathers

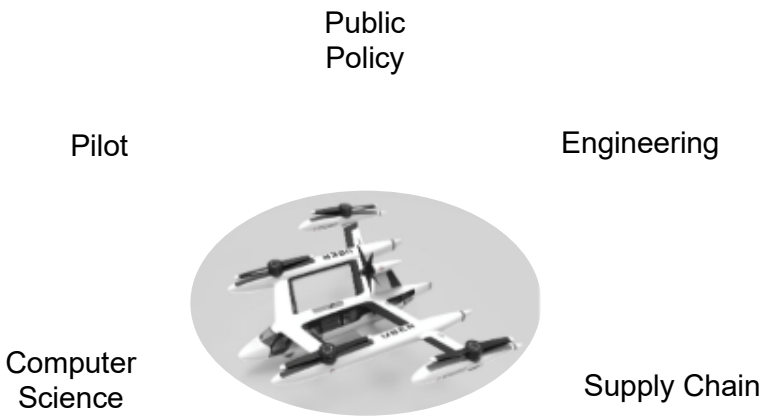
Why drones could pose a greater risk to aircraft than birds

To Make Self-Driving Cars Safe, We Also Need Better Roads and Infrastructure

Self-Driving Uber Car Kills Pedestrian in Arizona, Where Robots Roam

Many of these new jobs will require college degrees or specialized training.

- **20+ programs** announced.
- Certificate and associate programs typically focus on **drone piloting** and operations.
- Bachelor's and graduate programs focus on **UAV technology**, including software and hardware engineering, and even cybersecurity.
- Future courses or programs may be needed to address regulatory and public policy issues, cybersecurity, supply chain and logistics management, and sales and marketing.
- MOOCs (edX, Coursera, Udacity) offer courses and micro-credentials for self-driving car technology.

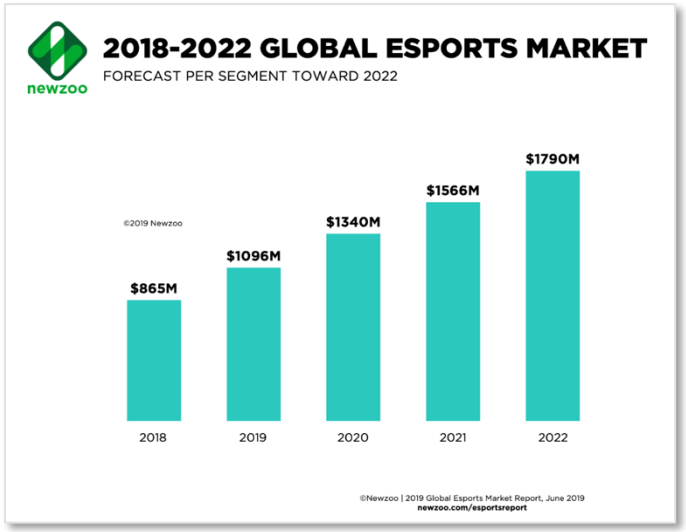


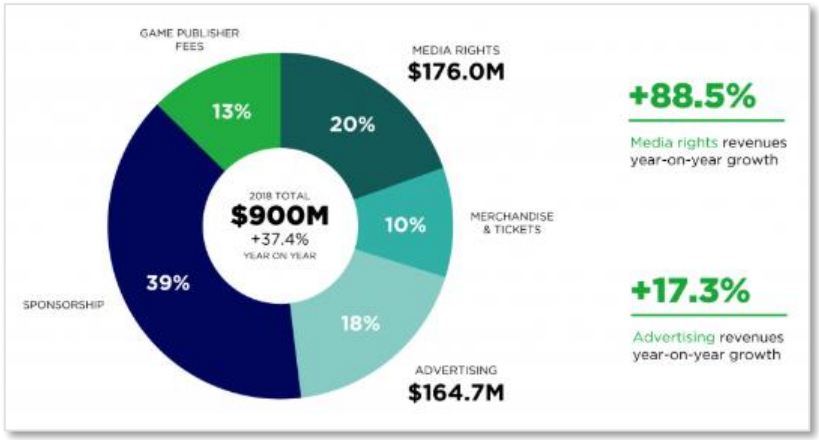
New Program Announcements: 2018-2019

Degree Level	# Programs
Certificate	4
Associate	4
Bachelor's	7
Master's/Grad Cert	5
PhD	2

The global esports market is expected to reach $1.1 billion in 2019 and grow to $1.8 billion by 2022.

- Sponsorships generate the most revenue, estimated at $457 million in 2019.
- Media rights are the fastest-growing market segment with 2019 revenues of $176 million, up 88.5% from 2018.
  - By 2021, industry tracker Newzoo predicts that all major media conglomerates in the U.S. will have digital esports media rights.
- North America is the largest geographic market, with 2019 revenues of $409 million; second is China at $210 million.
- Franchise values are rising: League of Legends franchises sold for $10 million in 2017; by 2018 they were valued at $50 million. Overwatch franchise valuations rose from $20 billion in 2017 to an estimated $60-$80 million in 2018.





Source: https://newzoo.com/insights/articles/newzoo-global-esports-economy-will-top-1-billion-for-the-first-time-in-2019/; https://www.su.edu/esports/; https://www.cnbc.com/2019/04/14/league-of-legends-gets-more-viewers-than-super-bowlwhats-coming-next.html; https://www.forbes.com/sites/mikeozanian/2018/10/23/the-worlds-most-valuable-esports-companies-1/#4eb56b3a6a6e

Esports: What is it?

Esports, or electronic sports, is professional competitive video gaming.

- Esports operates much like traditional sports, with leagues based on popular games, such as Fortnite, League of Legends, and Call of Duty.
- Gamers and esports teams compete at organized tournaments and online; they are watched by million of fans in-person, on television, or through streaming services such as Twitch.
- Successful gamers, like professional athletes, have loyal "fandoms" and can earn millions of dollars in prize money, sponsorships, endorsements, and salaries.



Lionel Bonaventure | AFP | Getty Images

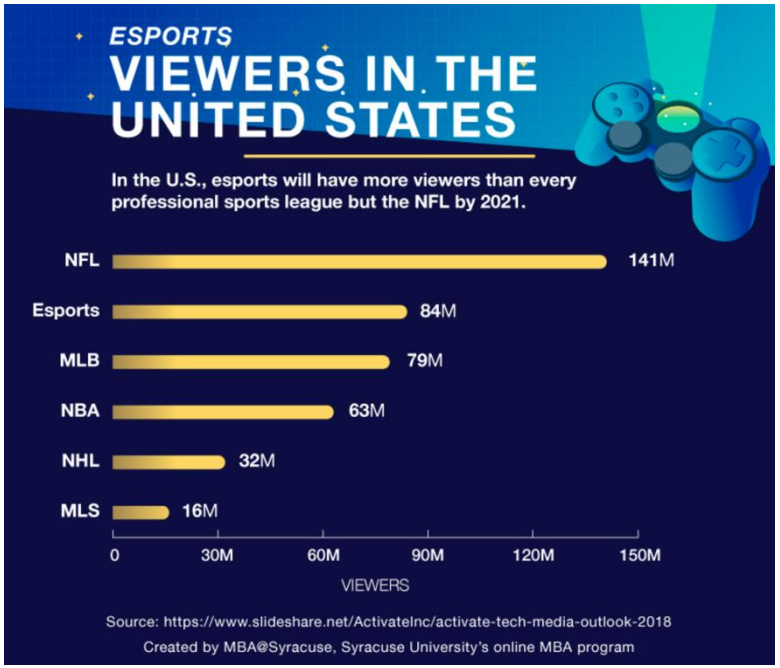
- Major esports players include streaming service Twitch (bought by Amazon in 2014 for almost $1 billion), gaming companies such as Activision Blizzard and Tencent, and esports teams and organizations such as Team Liquid and Cloud9.
- Some industry enthusiasts predict esports will become an Olympic sport; esports was included as a demonstration event at the 2018 Asian Games.

"The world of competitive video gaming is a fast-growing international phenomenon with millions of fans and billions of dollars up for grabs." - CNN

Sources: https://www.cnn.com/2018/08/27/us/esports-what-is-video-game-professional-league-madden-trnd/index.html; https://www.su.edu/esports/; https://www.businessinsider.com/complexity-gaming-opens-new-headquarters-on-dallas-cowboys-campus-2019-5; https://onlinebusiness.syr.edu/blog/esports-to-compete-with-traditional-sports/

Viewership of esports rivals that of major league sports and may grow even bigger.

- Industry tracker Newzoo estimates the 2019 worldwide audience for esports at 454 million people, segmented by eSports enthusiasts (201 million) and occasional viewers (253 million).
- More people (100 million) watched the League of Legends World Championship finals in 2018 than watched the Super Bowl (98 million).
- Technology consultancy Activate estimates that by 2021, esports will have a larger viewership in the U.S. than all professional sports leagues except for the NFL.



- In fact, traditional sports franchises are entering the esports arena:
  - Dallas Cowboys owner Jerry Jones purchased a majority stake in Complexity Gaming and opened an 11,000 square foot performance center at the Cowboy's headquarters.
  - The New York Yankees entered a partnership with Vision Esports, an esports investment firm.
  - The NBA launched an eSports league around the NBA 2K game franchise, and even held a draft to select 102 professional eSports players.

Source: https://newzoo.com/insights/articles/newzoo-global-esports-economy-will-top-1-billion-for-the-first-time-in-2019/; https://www.su.edu/esports/; https://www.cnbc.com/2019/04/14/league-of-legends-gets-more-viewers-than-super-bowlwhats-coming-next.html; https://onlinebusiness.syr.edu/blog/esports-to-compete-with-traditional-sports/

Esports in higher education is evolving from an activity to a field of study.

- **Varsity Teams:** Varsity collegiate esports began in 2014 with Robert Morris University's scholarship-sponsored League of Legends team.
  - By December 2019, over 170 schools, with over 5,000 student-athletes, participate in esports through the National Association of Collegiate Esports (NACE), which was formed in 2016.
- **Scholarships:** NACE estimates that most member schools offers annual eSports scholarships, averaging $7,600 each. Some schools, such as Harrisburg University of Science and Technology, even offer full **scholarships** for their entire varsity teams.
- **Facilities:** Institutions are building esports facilities for their teams and programs.
  - The University of Akron opened a 5,200-foot esports facility in fall 2018 costing $750,000. At the same time, the university announced the closure of 80 academic programs.
- **Programs:** Esports is making its way into the curriculum with programs focused on esports business and management (akin to a sports management degree):
  - **Becker College** launched the nation's first eSports program in fall 2018, with a BS in eSports Management.
  - **Shenandoah University** launched a BS in eSports Management in fall 2019.
  - **Caldwell University** launched a Bachelor of Science in eSports Management in fall 2019 through the School of Business and Computer Science.
  - **The Ohio State University** plans to launch undergraduate and graduate esports programs in fall 2020. The university also opened a new esports arena and announced plans for esports-related research.

Sources: Gray Associates New Program Announcement database: http://fortune.com/2018/08/17/this-school-is-cutting-80-degree-programs-while-building-the-worlds-largest-e-sports-facility/; https://nacesports.org/; https://www.scholarships.com/financial-aid/college-scholarships/sports-scholarships/esports-scholarships-scholarships-for-gamers/; https://nacesports.org/about/ https://www.insidehighered.com/news/2017/06/09/esports-quickly-expanding-colleges

Growing interest in the microbiome has implications for many fields of study.



- **Medicine/Biomedical Sciences:** Continued research is leading to the development of new therapies and diagnostic tools and may change the way doctors and practitioners treat diseases and chronic conditions.



- **Nutrition and Wellness:** You are what you eat. The foods people eat affect the microbiome, suggesting diet has the potential to alter the progression and outcomes of diseases and conditions affected by the microbiome.



- **Informatics and Data Science:** Research, diagnostic and therapeutic applications often involve large datasets that need to be managed and analyzed by trained data scientists and bioinformaticians.



- **Mental Health Counseling:** Some research points to a connection between mental health and the microbiome, opening possibilities for mental health counseling and psychology.