



Cloud & AI Skills for Undergraduates

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Fastest Growing Occupations in the United States, 2021-2031



<https://www.bls.gov/emp/tables/fastest-growing-occupations.htm>

What is Cloud Computing?

A Definition of Cloud Computing

Cloud computing is the on-demand delivery of computer system resources via the internet with pay-as-you-go pricing.

Cloud Computing in a Nutshell

Creation



Deployment

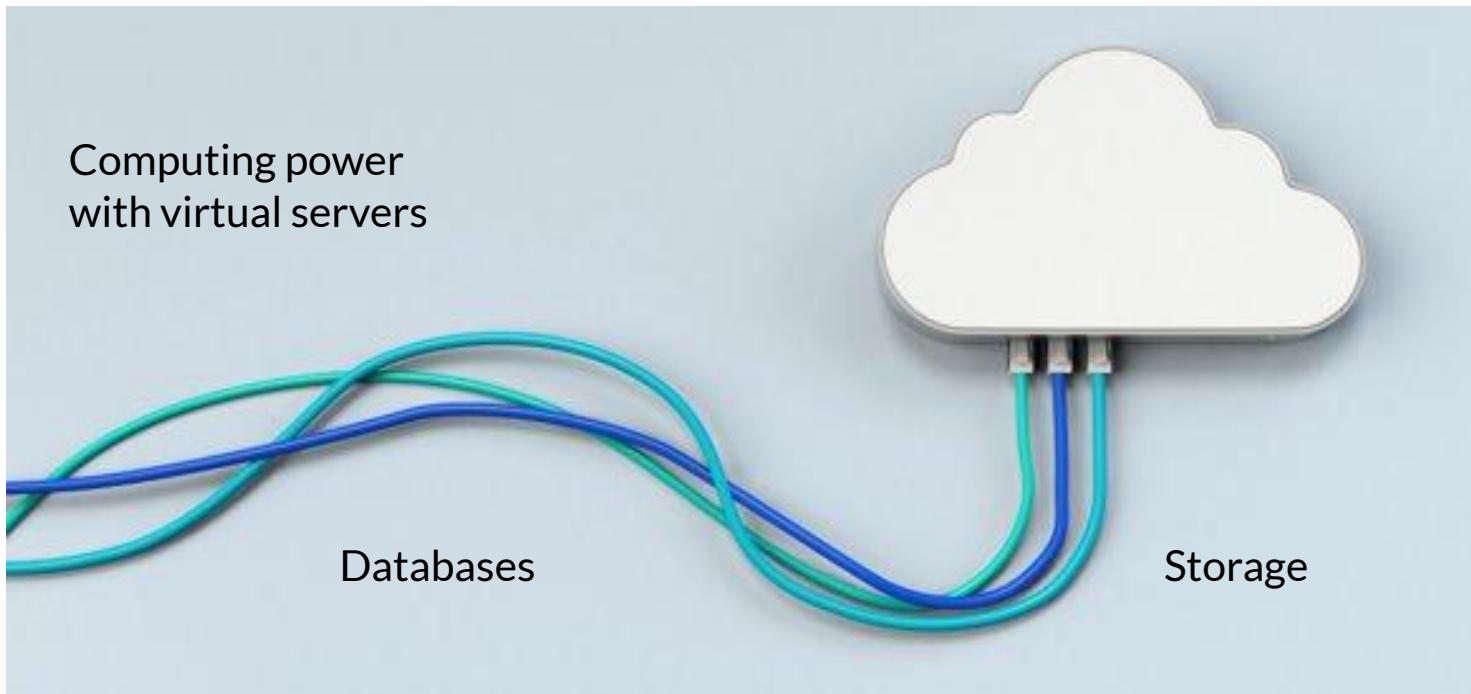


Destruction



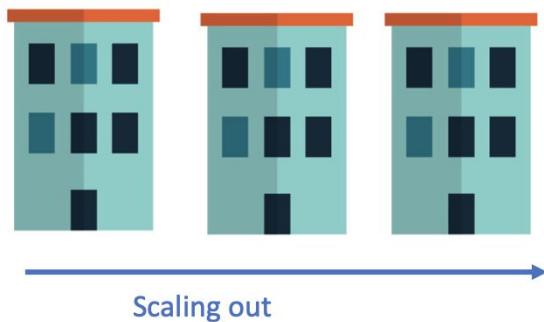
Three Common Ingredients in Cloud Computing

Three Common Ingredients in Cloud Computing

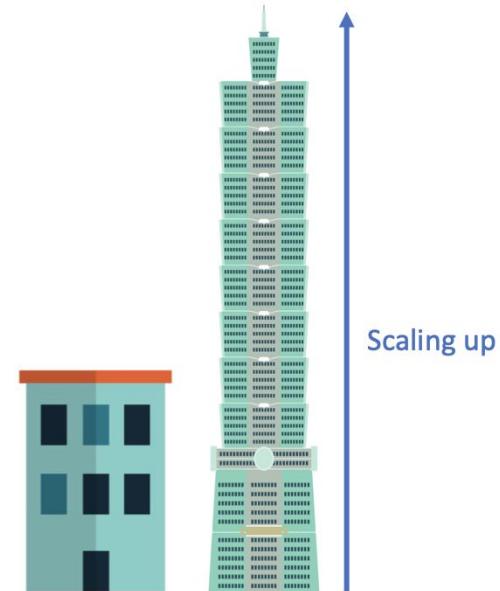


Elastic Compute

Horizontal Scaling – scaling out and scaling in

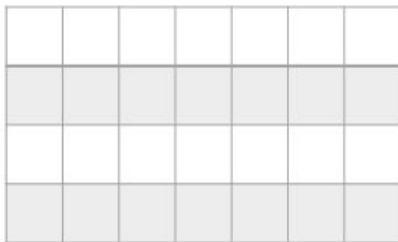


Vertical Scaling – scaling up and scaling down



Data

Structured or Tabular Data



Unstructured or Semi-Structured Data

{ Author: 'Collins', 'Gladwell', 'Martin', 'Harris' }

{ Title: 'GoldenEye', 'Four Weddings and a Funeral' }



Something As A Service (SAAS)

Pizza as a Service

	Traditional On-Prem	Infrastructure as a Service (IaaS)	Platform as a Service (PaaS)	Software as a Service (SaaS)
■ You manage	Dining Table	Dining Table	Dining Table	Dining Table
	Soda	Soda	Soda	Soda
	Electricity or Gas	Electricity or Gas	Electricity or Gas	Electricity or Gas
	Oven	Oven	Oven	Oven
	Fire	Fire	Fire	Fire
	Pizza Dough	Pizza Dough	Pizza Dough	Pizza Dough
	Tomato Sauce	Tomato Sauce	Tomato Sauce	Tomato Sauce
	Toppings	Toppings	Toppings	Toppings
	Cheese	Cheese	Cheese	Cheese
	Made at Home	Take and Bake	Pizza Delivery	Dining Out

Cloud Providers

Selected Cloud Service Providers

Amazon Web Services



Microsoft Azure



Google Cloud Platform



IBM Cloud



Smart Notebooks

Jupyter = Julia + Python + R



An application programming interface (API) is a way for two or more computer programs to communicate with each other.

An API is a type of software interface, offering a service to other pieces of software.

The Jupyter Notebook web application provides a graphical interface for creating, opening, renaming, and deleting files in a virtual filesystem.

Internally, the Jupyter Notebook defines an abstract API for translating these interactions into operations on a particular storage medium.

Hands-On Activity

Team up with two students. Illustrate the four stages of *Something as a Service* (e.g., On-Prem, IaaS, PaaS, SaaS) with a process of your choice.



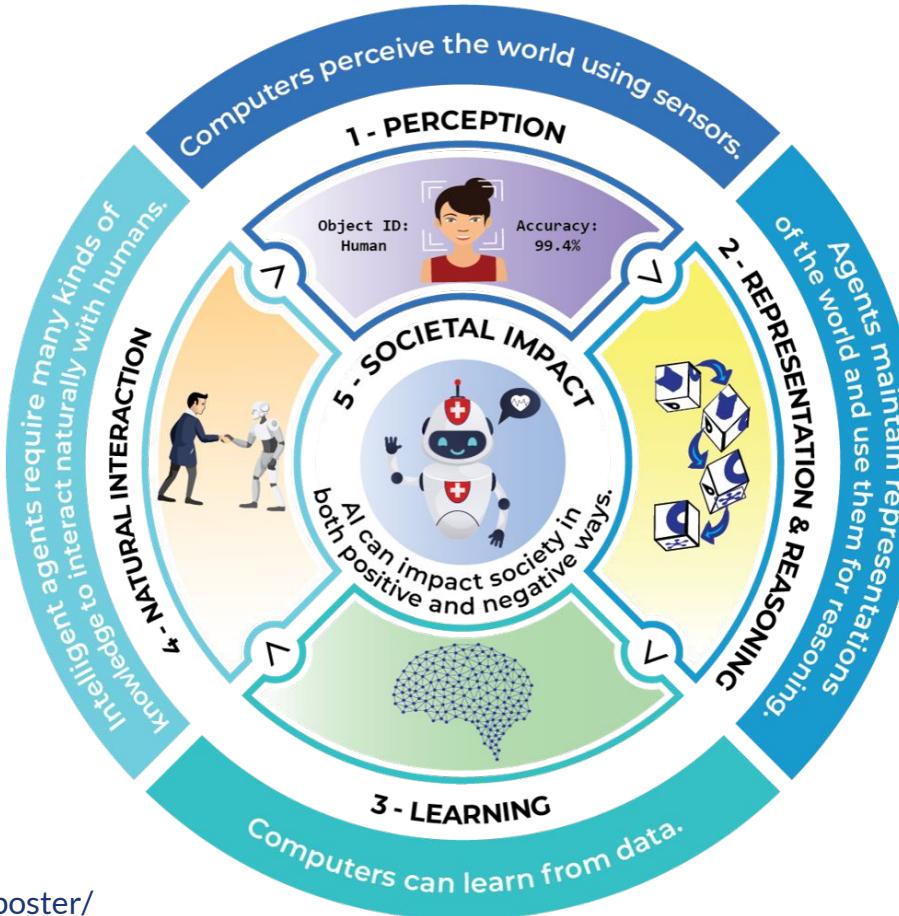
What is Artificial Intelligence (AI)?



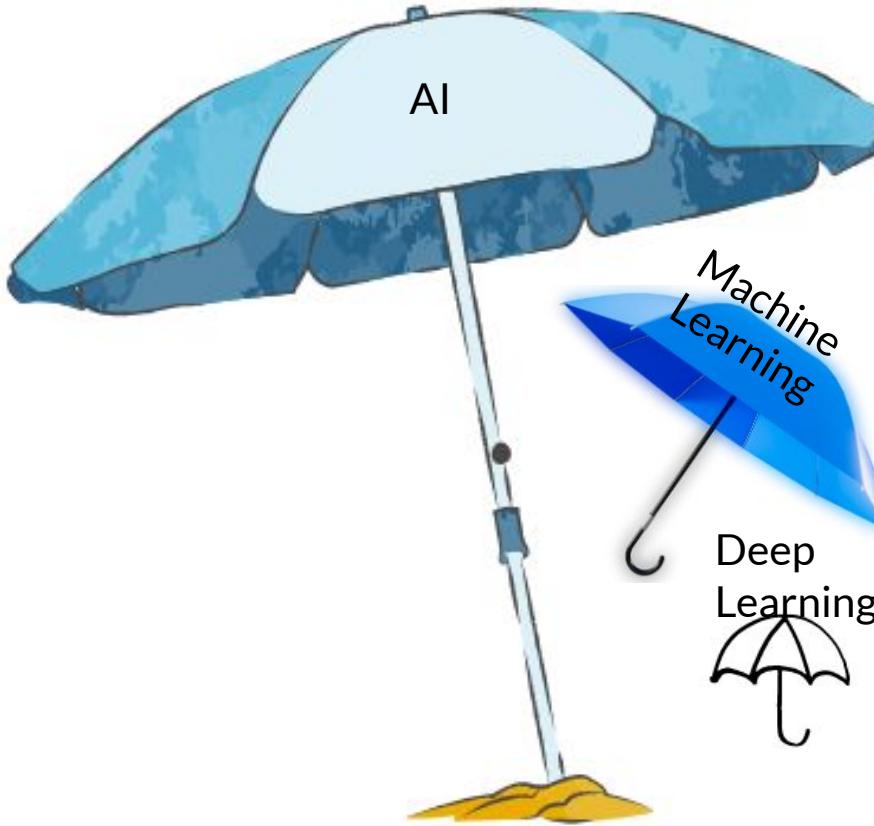
AI in a Nutshell

AI is a sophisticated form of automation where computers take input data and make decisions or predictions.

Five Big Ideas in Artificial Intelligence



AI versus Machine Learning versus Deep Learning



<https://www.ibm.com/cloud/blog/ai-vs-machine-learning-vs-deep-learning-vs-neural-networks>

Hot Skills

AI Hot Skills

PyTorch



pandas

Python

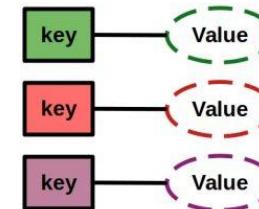
PySpark

NumPy

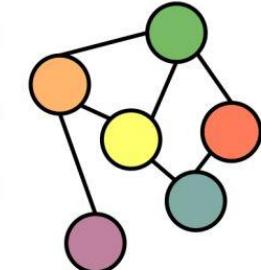
SQL



Key-Value



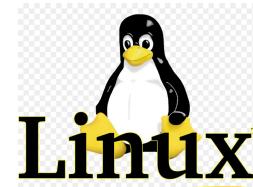
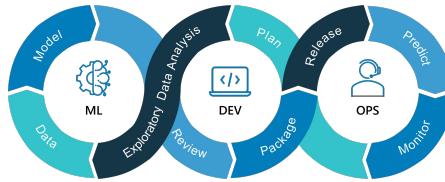
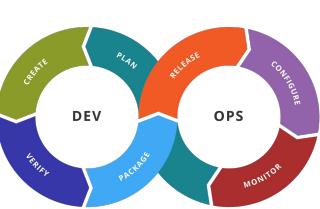
Graph



NoSQL

<https://www.onetonline.org/link/demand/15-2051.00>

Cloud Hot Skills



Certifications

Amazon Web Services Certifications

Professional

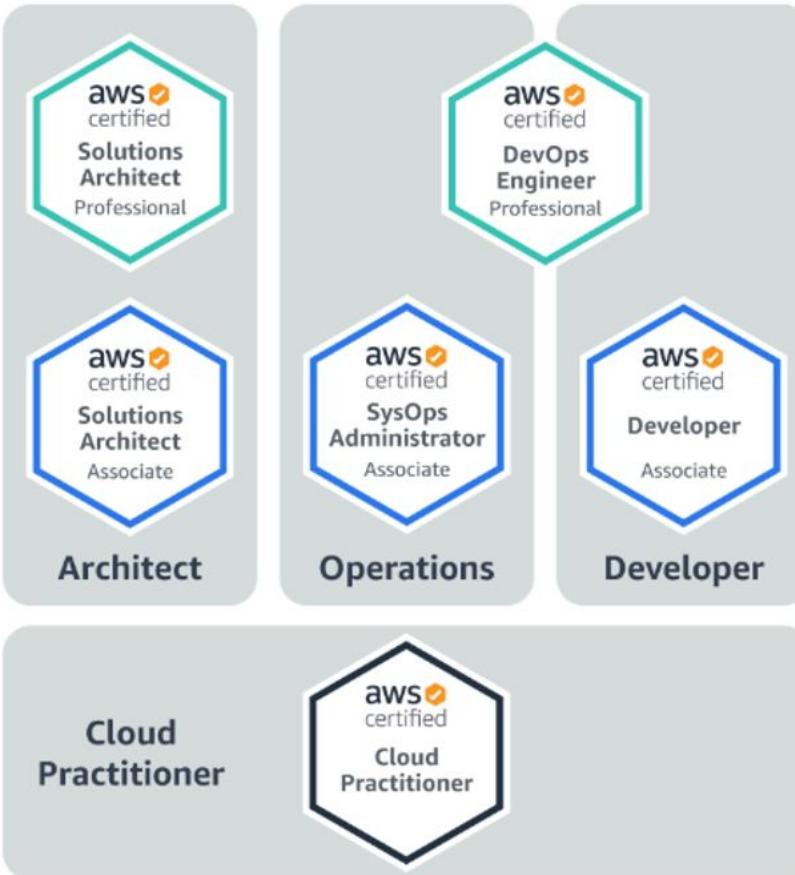
Two years of comprehensive experience designing, operating, and troubleshooting solutions using the AWS Cloud

Associate

One year of experience solving problems and implementing solutions using the AWS Cloud

Foundational

Six months of fundamental AWS Cloud and industry knowledge



Specialty

Technical AWS Cloud experience in the Specialty domain as specified in the exam guide



Microsoft Azure Certifications



Fundamentals-Level

Azure Fundamentals
Azure AI Fundamentals
Azure Data Fundamentals
Security, Compliance, and Identity Fundamentals

Associate-Level

Azure Administrator Associate
Azure Developer Associate
Azure Security Engineer Associate
Azure Network Engineer Associate
Azure AI Engineer Associate
Azure Data Scientist Associate
Azure Data Engineer Associate
Azure Database Administrator Associate
Security Operations Analyst Associate
Identity and Access Administrator Associate

Expert-Level

Azure Solutions Architect Expert
Azure DevOps Engineer Expert

Specialty-Level

Azure for SAP Workloads Specialty
Azure Virtual Desktop Specialty
Azure IoT Developer Specialty

Google Cloud Certifications

Foundational Level

No hands-on experience with Google Cloud is required



Associate

Recommended 6+ months building on Google Cloud



Professional

Recommended 3+ years industry experience, including 1+ years using Google Cloud



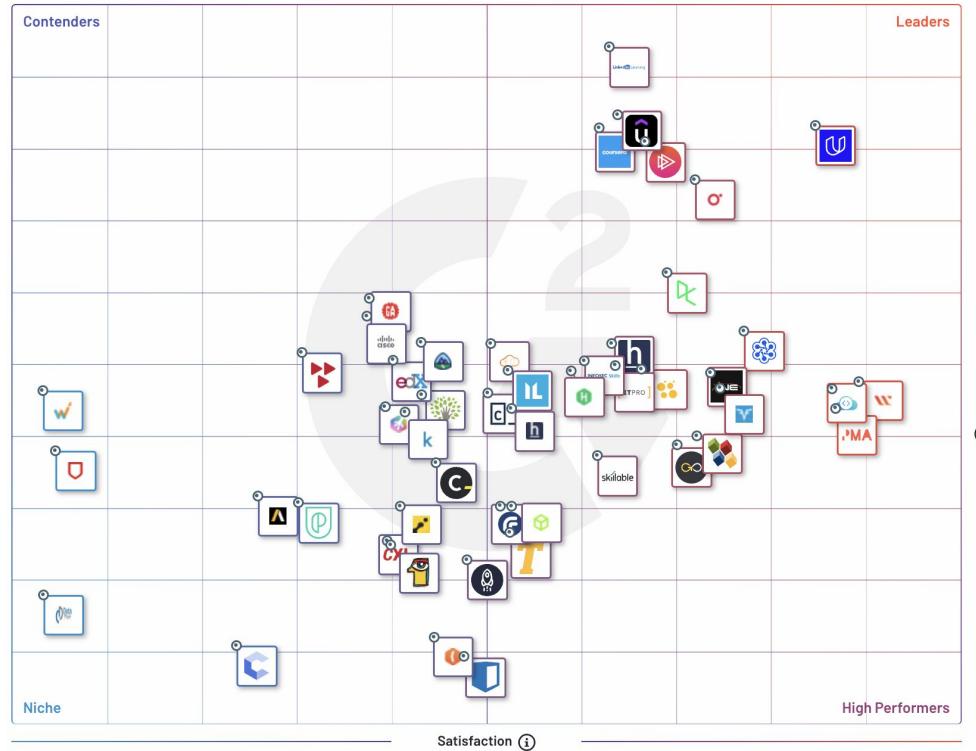
Expert level

Recommended 10+ years of professional experience and 1+ year experience designing enterprise solutions with Anthos



Self-Paced Technical Skills Development

Technical Skills Development



<https://www.g2.com/categories/technical-skills-development#grid>

The Carpentries (Free)

The screenshot shows the homepage of The Carpentries website at carpentries.org. The header features a navigation bar with links for HOME, ABOUT, TEACH, LEARN, JOIN US, OUR COMMUNITY, CONNECT, and DONATE. The main content area has a background image of people working on laptops. On the left, there's a logo consisting of three blue interlocking shapes next to the text "THE CARPENTRIES". To the right, a large text block reads: "We teach foundational coding and data science skills to researchers worldwide." Below this, there are logos for DATA CARPENTRY, library Carpentry, and software carpentry. At the bottom, there are three icons with text: a laptop icon labeled "What we do", a people icon labeled "Who we are", and a speech bubble icon labeled "Get involved".

carpentries.org

HOME ABOUT TEACH LEARN JOIN US OUR COMMUNITY CONNECT DONATE

 THE CARPENTRIES

We teach foundational coding and data science skills to researchers worldwide.


library Carpentry

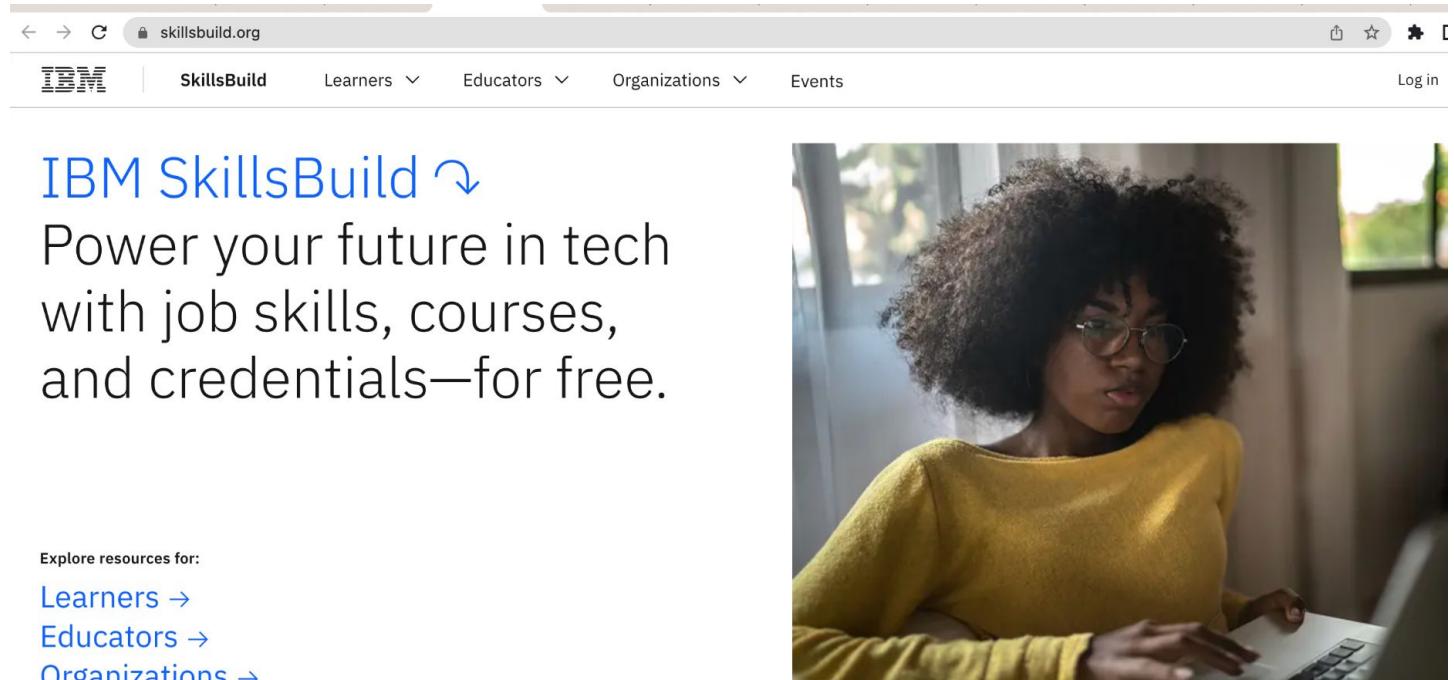

 What we do

 Who we are

 Get involved

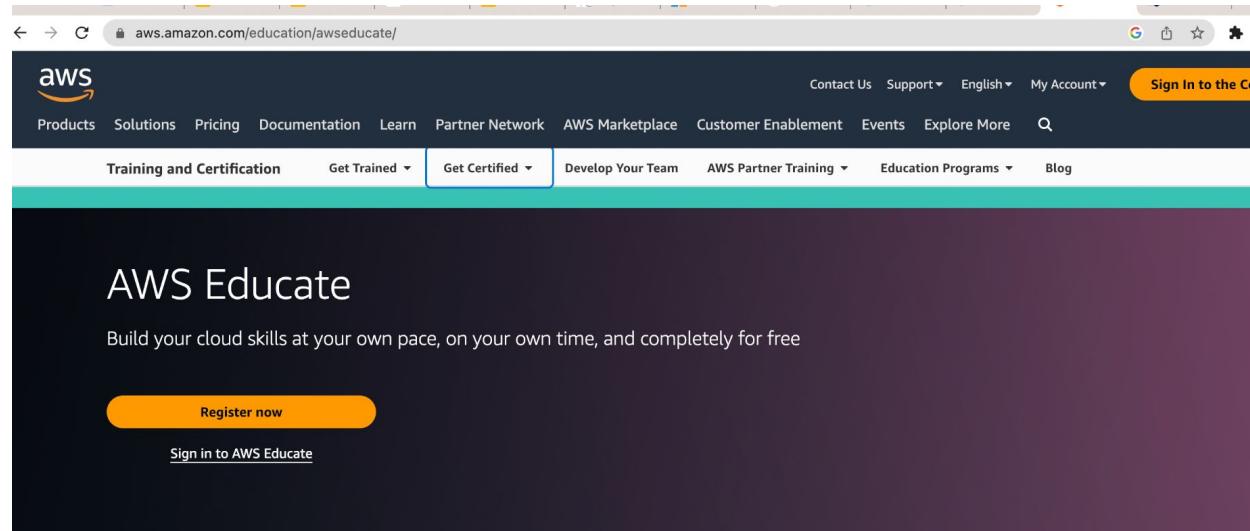
The Carpentries teaches foundational and
Our diverse global community includes
See all the ways you can connect with The

IBM SkillsBuild (Free)



The screenshot shows the homepage of the IBM SkillsBuild website at skillsbuild.org. The header includes the IBM logo, a search bar, and navigation links for Learners, Educators, Organizations, and Events, along with a Log in link. The main content features the text "IBM SkillsBuild" with a blue arrow icon, followed by the tagline "Power your future in tech with job skills, courses, and credentials—for free." Below this, there's a section titled "Explore resources for:" with links to "Learners →", "Educators →", and "Organizations →". To the right of the text is a photograph of a woman with curly hair wearing glasses and a yellow sweater, sitting at a desk and looking at a laptop screen.

AWS Educate (Free)



The screenshot shows the AWS Educate homepage at aws.amazon.com/education/awseducate/. The page features a dark header with the AWS logo and navigation links like Products, Solutions, Pricing, Documentation, Learn, Partner Network, AWS Marketplace, Customer Enablement, Events, Explore More, and a search bar. Below the header, there's a secondary navigation bar with categories such as Training and Certification, Get Trained, Get Certified (which is highlighted with a blue border), Develop Your Team, AWS Partner Training, Education Programs, and Blog. The main content area has a teal header with the text "AWS Educate". Below it, a dark background section contains the text "Build your cloud skills at your own pace, on your own time, and completely for free" and two buttons: "Register now" and "Sign in to AWS Educate".

Start your cloud journey with AWS Educate today

AWS Educate is open to any individual, regardless of where they are in their education, technical experience, or career journey.

If you're overwhelmed by too many choices when it comes to learning about the cloud, AWS Educate is here to help. Cloud beginners like you are invited to check out our free, self-paced online training resources and labs designed to help you learn, practice, and evaluate your cloud skills without having to create an Amazon account.



Do Not Wait

- Start upskilling or re-skilling right away, while supplementing your current (or future) degree.
- Suggestions
 - Python, R, SQL: DataCamp, The Carpentries
 - Cloud Technologies: IBM SkillsBuild, AWS Educate, Cloud Academy, A Cloud Guru, Pluralsight Skills

Occupational Profiles

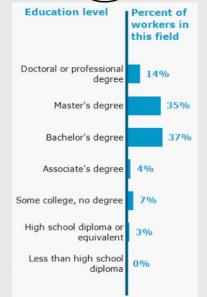
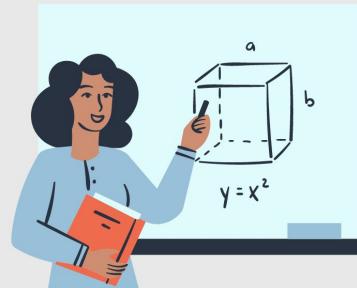
Anatomy of a Mathematician

A Day in the Life

Analyze data to identify trends or relationships among variables.

Prepare analytical reports.

Update knowledge about emerging industry or technology trends.



Soft Skills

Thinking about the pros and cons of different ways to solve a problem.

Noticing a problem and figuring out the best way to solve it.

Figuring out how to use new ideas or things.



Common Job Roles

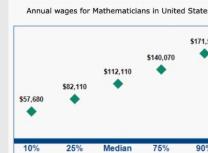
Computational Scientist

Cryptographic Vulnerability Analyst

Image Scientist

Knowledge Engineer

Research Scientist





Occupational Profiles Data

Occupational Information Network: <https://www.onetonline.org/>

CareerOneStop: <https://www.careeronestop.org/>

Glassdoor: <https://www.glassdoor.com/>

Hands-On Activity

Use your personal Google account for signing-in in the homepage of Glassdoor.

Go to tab **Careers**, choose **Discover Careers** from the dropdown.

In the **Find Your Dream Career** field, select the phrase 'Data Scientists Career'.

Under **Overview**, read the section "What does a Data Scientist do?"

Select tab **Career Path**.

Use Glassdoor, Indeed, and ZipRecruiter to search for jobs with the following:

Keywords: Python, SQL, and R

Keywords: AWS, Python, SQL, and R

Keywords: Azure, Python, SQL, and R

Ariel's Trajectory

Numerical Optimization
Evolutionary Algorithms
Network Science

Stochastic Processes
Uncertainty Quantification
Monte Carlo Sampling

Regression
Inverse Problems
Sensitivity Analysis



Ariel's Educational Technology Skills

LMS

- D2L
- Canvas
- Moodle
- SmarterU

Video Editing

- Camtasia
- SOM
- Screencastify

Collaboration Tools

- Microsoft Teams
- Slack
- Trello

Adaptive Learning

- Mobius by DigitalEd
- Edfinity
- ALEKS by McGraw Hill

E-Learning Authoring Tools

- Adobe Captivate
- LaTeX
- RMarkdown
- Google Suite
- Microsoft 365

ISTE Certification

- UDL
- SAMR Model
- Student-Centric
- Computational Thinking
- Digital Citizenship

Curriculum Development

300+ original videos

Asynchronous

Synchronous

Precalculus Algebra

Precalculus Trigonometry

Differential Calculus

Integral Calculus

Linear Algebra

Differential Equations

Mathematical Computing

Mathematical Modeling

Infectious Disease Modeling

Thank You!

¡Muchas Gracias!

