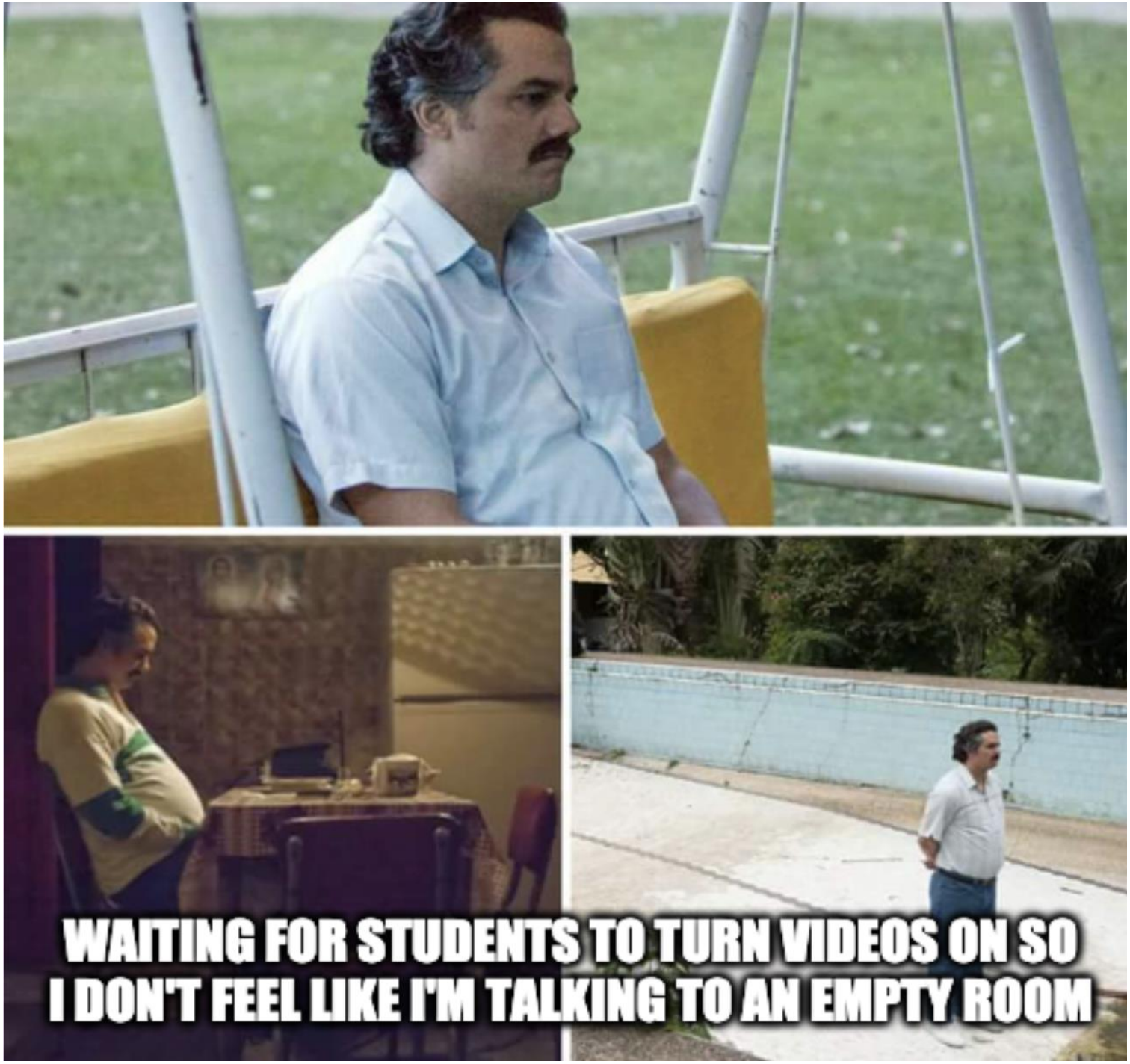
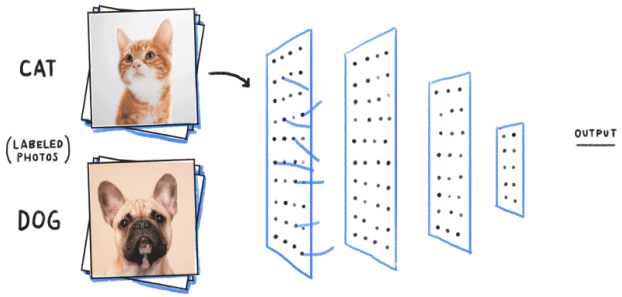
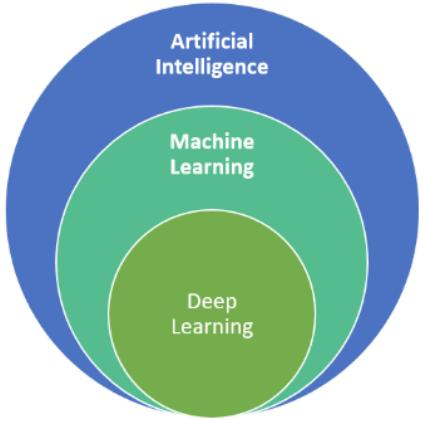

WAITING FOR STUDENTS TO TURN VIDEOS ON SO
I DON'T FEEL LIKE I'M TALKING TO AN EMPTY ROOM

UIT
TRƯỜNG ĐẠI HỌC
CÔNG NGHỆ THÔNG TIN

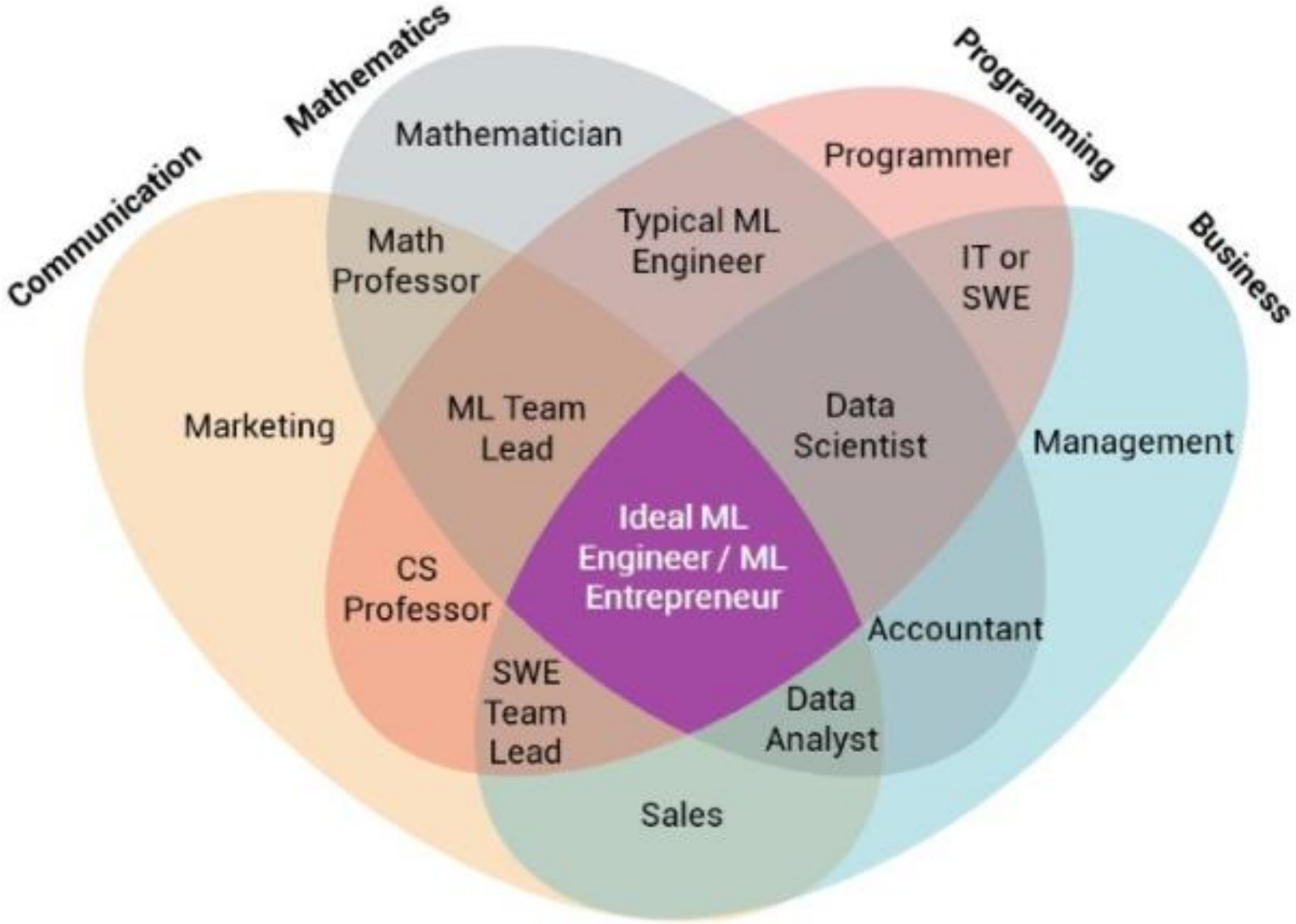
THỊ GIÁC MÁY TÍNH TRONG TƯƠNG TÁC NGƯỜI MÁY

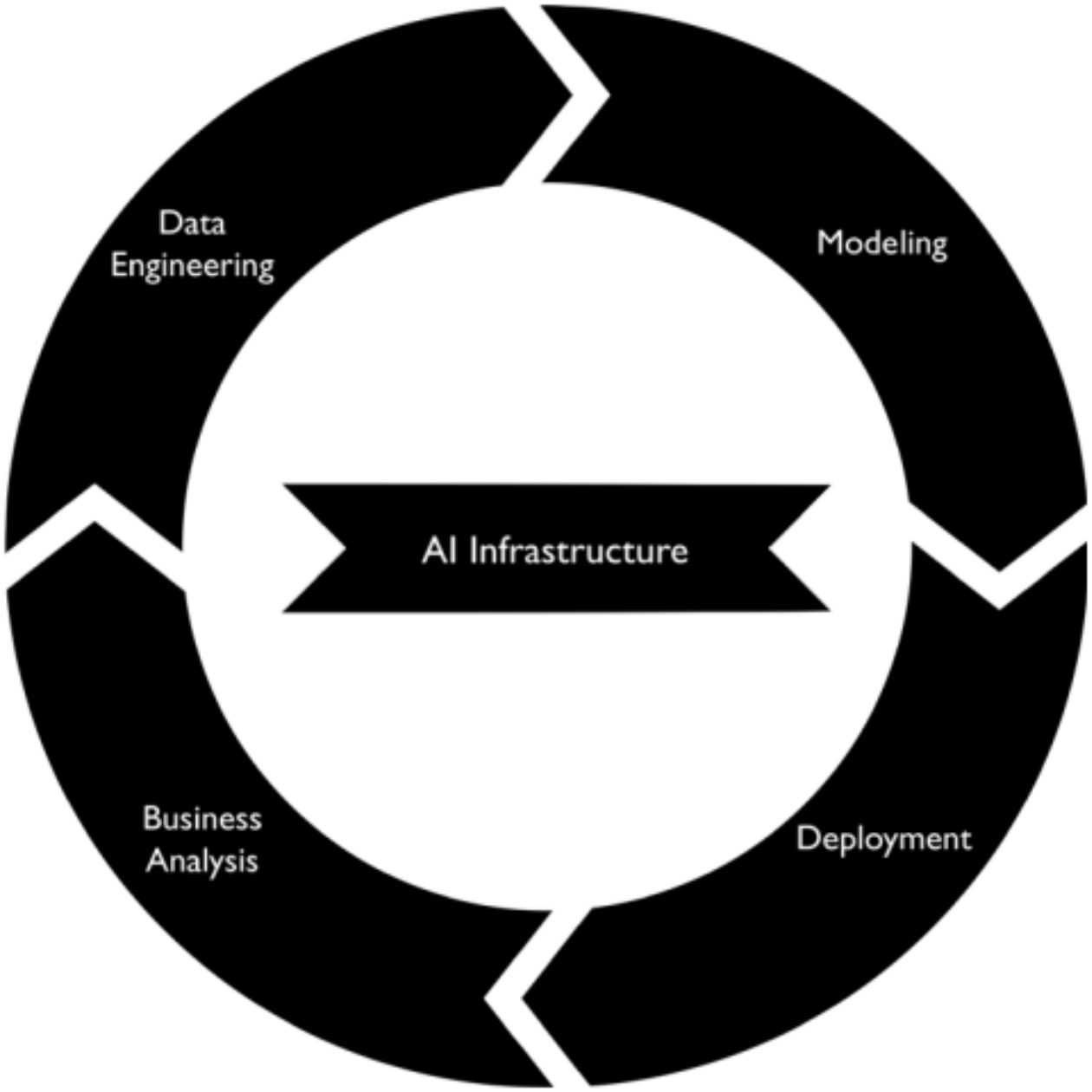
Computer Vision in Human - Computer Interaction



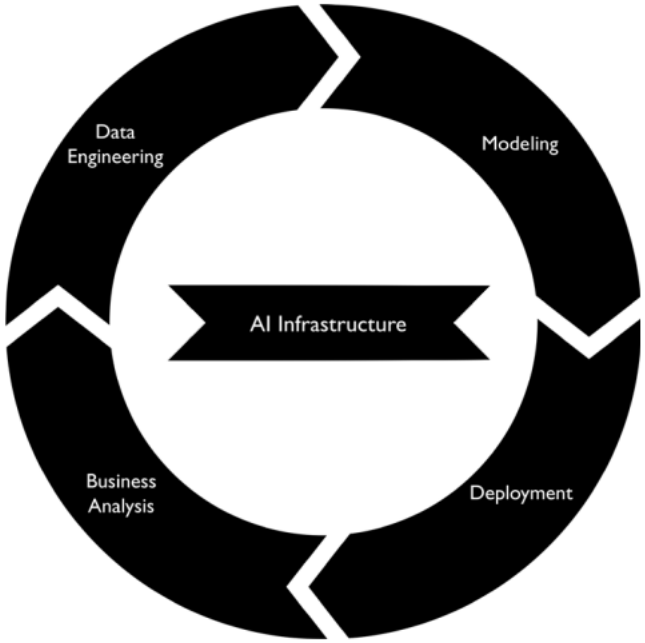


AI Career Pathways


Mathematics
Programming
Communication
Business
Mathematician
Programmer
Typical ML Engineer
Math Professor
IT or SWE
Marketing
ML Team Lead
Data Scientist
Management
Ideal ML Engineer / ML Entrepreneur
CS Professor
Accountant
SWE Team Lead
Data Analyst
Sales


Data
Engineering
Modeling
AI Infrastructure
Business
Analysis
Deployment

Executive Summary



Developing an AI project development life cycle involves five distinct tasks:

- **Data engineering:** People responsible for data engineering prepare data and transform data into formats that other team members can use.
- **Modeling:** People assigned to modeling look for patterns in data that can help a company predict outcomes of various decisions, identify business risks and opportunities, or determine cause-and-effect relationships.
- **Deployment:** People in charge of deployment take a stream of data, combine it with a model, and test the integration before putting the model into production.
- **Business analysis**: Team members responsible for business analysis evaluate a deployed model's performance and business value and adjust accordingly to maximize benefit or abandon unproductive models.
- **AI infrastructure:** People who work in AI infrastructure build and maintain reliable, fast, secure, and scalable software systems to help people working in data engineering, modeling, deployment and business analysis.

Data engineering work includes:

Subtask	Examples	Skills involved
Defining data requirements	- Creating a data model - Defining the features of high-quality data - Defining the covariates to be collected to achieve a desired functionality - Providing feedback regarding the clarity and completeness of data requirements	Machine learning Business acumen Software engineering
Collecting data	- Setting up a Mechanical Turk project - Collecting data by manually taking images of cats - Coding a JavaScript tracker on a website to collect user data - Scraping the web and, if necessary, synchronizing data from different sources	Machine learning Software engineering
Labeling data	- Drawing bounding boxes on images - Building a labeling pipeline using Mechanical Turk - Writing a labeling tutorial for workers - Relabeling mislabeled data - Evaluate the labeling performance of workers	Machine learning Software engineering
Inspecting and cleaning data	- Replacing all non-usable structured data records by NaN using a Python library (e.g. pandas) - Converting a continuous feature into a categorical feature using bucketing - Reformatting a data set (for instance, converting images to jpeg and squaring them) - Cleaning a text dataset (for instance, removing special characters)	Machine learning Algorithmic coding

Data engineering work includes :

Augmenting data	- Writing a Python script using skimage to rotate, warp, translate, or blur images - Using test-time augmentation to reduce the variance of an algorithm - Synthesizing speech by overlaying distinct audio signals	Machine learning Algorithmic coding
Moving data and building data pipelines	- Writing a script to allow online learning for a model - Designing an ETL system - Writing a script to preprocess training data and send it as input to a model automatically - Writing a script to record model predictions in a database	Domain-specific (for instance, data query) languages
Querying data	- Pulling data from a database	Domain-specific (for instance, data query) languages
Tracing data	- Keeping track of data sources - Setting up a data version control system	Software engineering

Modeling work includes :

Subtask	Examples	Skills involved
Training machine learning models	- Using one of the following methods: Linear Regression, Logistic Regression, Decision Trees, Random Forest, XGBoost, Support Vector Machines, K-means, K-Nearest Neighbors, Neural Networks, Principal Component Analysis, Naive Bayes Classifier, Lasso/Ridge regression, etc.	Machine learning Algorithmic coding Mathematics Data science
Fitting probabilistic or statistical models	- Fitting a probabilistic graphical model - Testing hypotheses via data experiments - Applying a dimensionality reduction on a dataset to facilitate model training or gather insights	Data science Algorithmic coding Mathematics
Training deep learning models	- Using deep learning for a domain-specific application such as fraud detection, text summarization, machine translation, speech recognition, or object classification, detection, or segmentation - Tuning hyperparameters involved in neural network optimization	Deep learning Algorithmic coding Mathematics Data science
Accelerating training	- Setting up code to train a model on multiple machines in parallel	Domain-specific languages (for instance, CUDA) Algorithmic coding
Defining evaluation metrics (usually also involves a data product manager)	- Choosing F1-score to evaluate a model's performance on a classification task - Implementing evaluation metrics such as accuracy, precision, recall, intersection over union, or mean average precision (mAP)	Machine learning Algorithmic coding Mathematics

Modeling work includes :

Speeding up prediction time	- Applying techniques such as pruning, quantization, or compression to reduce memory requirements - Running inference speed vs. accuracy experiments on a model	Machine learning Algorithmic coding
Iterating over the virtuous cycle of machine learning projects: Idea, Code, Experiment	- Translating a business problem into a machine learning problem. For instance, depending on the quality and quantity of accessible data, an end-to-end network might lead to better results than a pipeline network - Implementing the three-step cycle of ideating with your team, coding to set up experiments, analyzing results	Machine learning Business acumen
Searching hyperparameters	- Organizing experiments to get results in the shortest time period - Setting up hyperparameter search experiments using tools such as AutoML	Machine learning Algorithmic coding
Keeping your knowledge up to date	- Reading research papers - Watching conference lectures or attending conferences	Research Mathematics Data science Machine learning

Deploy work includes :

Subtask	Examples	Skills involved
Converting prototyped code into production code	- Refactoring a repository's code - Minimizing duplicate code - Writing clean code to improve readability and consistency, for example, by following the PEP8 guidelines in Python	Software engineering
Setting up a cloud environment to deploy the model	- Mastering cloud tools and infrastructure provided by AWS, GCP, Azure, and the like - Preparing files (usually model architecture and parameters) for deployment	Software engineering
Branching (version control)	- Designing a branching workflow, and using development, staging and production branches - Participating in or leading code reviews	Software engineering
Improving response times and saving bandwidth	- Setting up load-balancing requirements with engineers in charge of AI Infrastructure	Software engineering

Deploy work includes :

Encrypting files that store model parameters, architecture, and data	- Understanding encryption at a high level and leveraging existing functions	Software engineering
Building APIs for an application to use a model	- Setting up HTTP RESTful API services to facilitate communications between software components - Setting up authorization and authentication to access the API	Software engineering
Retraining machine learning models (lifelong learning)	- Monitoring changes in data distribution and staging model updates	Software engineering Machine learning
Fitting models on resource-constrained devices	- Pruning or quantizing a model so it fits memory requirements - Deploying a model on a mobile device using TensorFlow	Software engineering Machine learning

Business Analysis work includes:

Subtask	Examples	Skills involved
Building data visualizations	- Visualizing high-dimensional data in lower dimensions using methods such as PCA or t-SNE - Building and presenting graphs produced using Tableau, ggplot or matplotlib - Building visualizations in JavaScript, HTML, or CSS	Domain-specific programming languages Data science Mathematics Business acumen
Building dashboards for business intelligence	- Writing a script that periodically notifies business leaders of trends in the data	Domain-specific programming languages Business acumen
Presenting technical work to clients or colleagues	- Preparing presentations (e.g., PowerPoints decks) - Communicating effectively with team members - Giving technical talks to present research outcomes	Communication Business acumen
Translating statistics into actionable business insights	- Making marketing decisions based on analysis of various sources	Data Science Business Acumen

Business Analysis work includes:

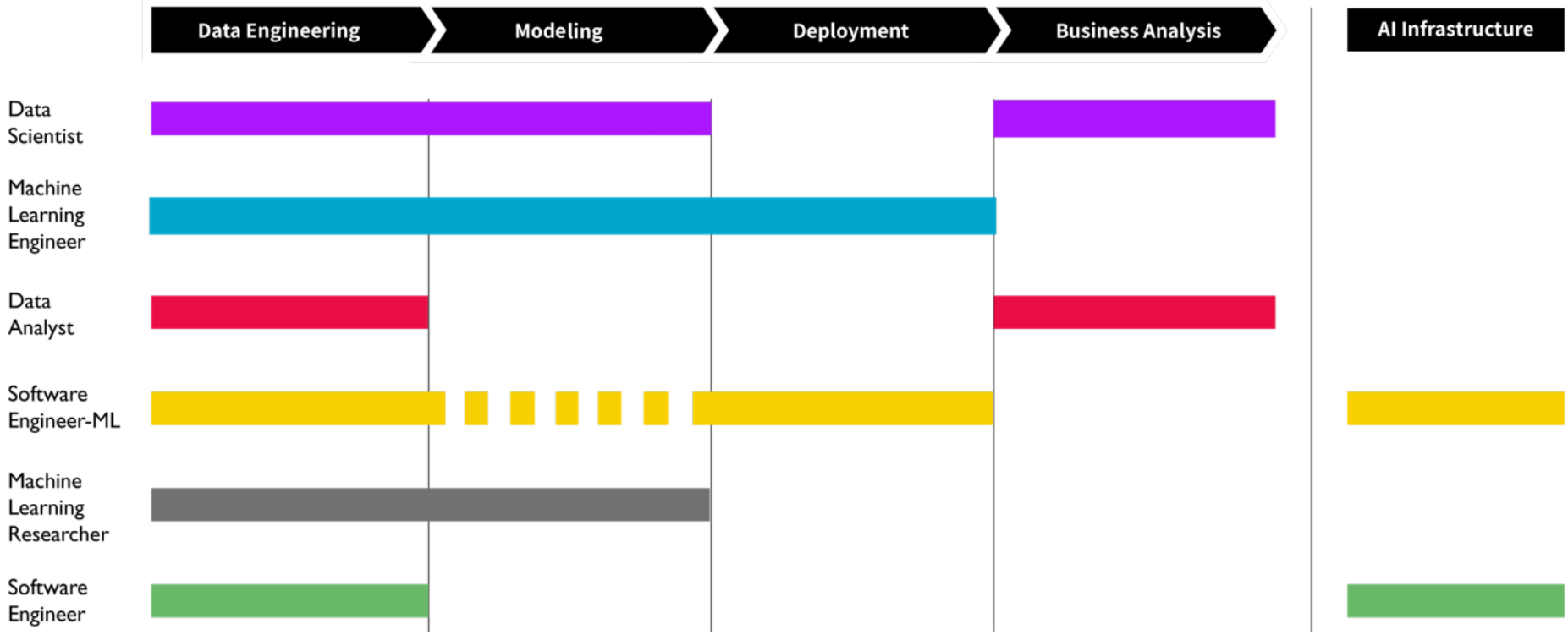
Analyzing datasets	- Plotting a correlation matrix to analyze covariates - Computing statistical variables such as mean, variance, and mode - Segmenting customers into groups	Data science Algorithmic coding Mathematics
Running experiments to evaluate deployed models	- Working with the deployment team to evaluate business performance of a deployed model - Helping the deployment team make decisions - Translating model performance into business outcomes such as revenue	Data science Algorithmic coding
Running A/B tests	- Optimizing web pages - Evaluating systems in production	Data science Algorithmic coding Business acumen

AI infrastructure work includes:

Subtask	Examples	Skills involved
Making software design decisions	- Reducing latency by locating a model close to data	Software engineering
Building distributed storage and database systems	- Building databases (SQL, NoSQL, MySQL, Cassandra, etc.) to store data and facilitating access by other team members	Software engineering Domain-specific languages
Designing for scale	- Adding GPU compute or storage as needed	Software engineering
Maintaining software infrastructure	- Managing software upgrades and driving stability through automated monitoring and alerting	Software engineering
Networking	- Controlling access to all infrastructure elements	Software engineering

AI infrastructure work includes:

Networking	- Controlling access to all infrastructure elements	Software engineering
Securing data and models	- Building security features that allow for production deployments into regulated organizations, satisfying the needs for privacy and security	Software engineering
Writing tests	- Writing unit and functional tests for multiple components across tasks of the AI project life cycle	Software engineering
Carrying out various software tasks	- Building a labeling program, A/B testing framework, or analysis environment	Software engineering


Data Engineering
Modeling
Deployment
Business Analysis
AI Infrastructure
Data Scientist
Machine Learning Engineer
Data Analyst
Software Engineer-ML
Machine Learning Researcher
Software Engineer

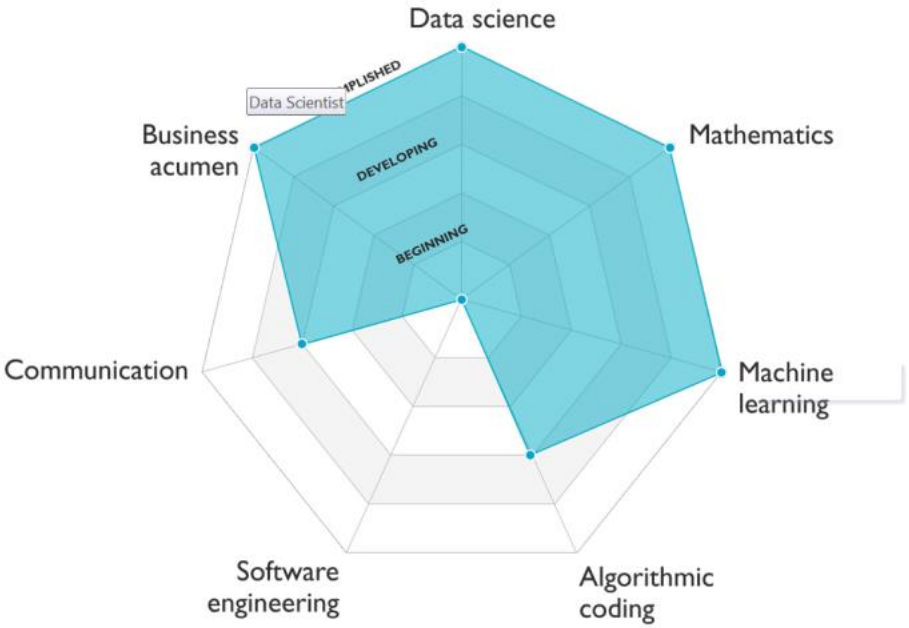
Data Scientist

- **Data science organizations** help a firm's leaders make scientific or data-driven decisions to run their business more effectively. Team members collect data, analyze datasets, and suggest hypotheses and actions.

- **Machine learning organizations** automate tasks to reduce costs or scale products. The output is the automation itself achieved by collecting data, training models, and deploying them.

Data Scientist

SKILLS



TOOLS

- **Modeling** in Python using packages such as numpy, scikit-learn, TensorFlow, and PyTorch
- **Data engineering** in Python and/or SQL or other domain-specific query languages
- **Business analysis** in Python, R, other domain-specific tools such as Tableau or Excel, or presentation software applications such as PowerPoint or Keynote
- **Collaboration and workflow** using a version control system such as Git, Subversion, or Mercurial along with a command line interface (CLI) such as Unix and an integrated development environment (IDE) such as Jupyter Notebook or Sublime

Springboard

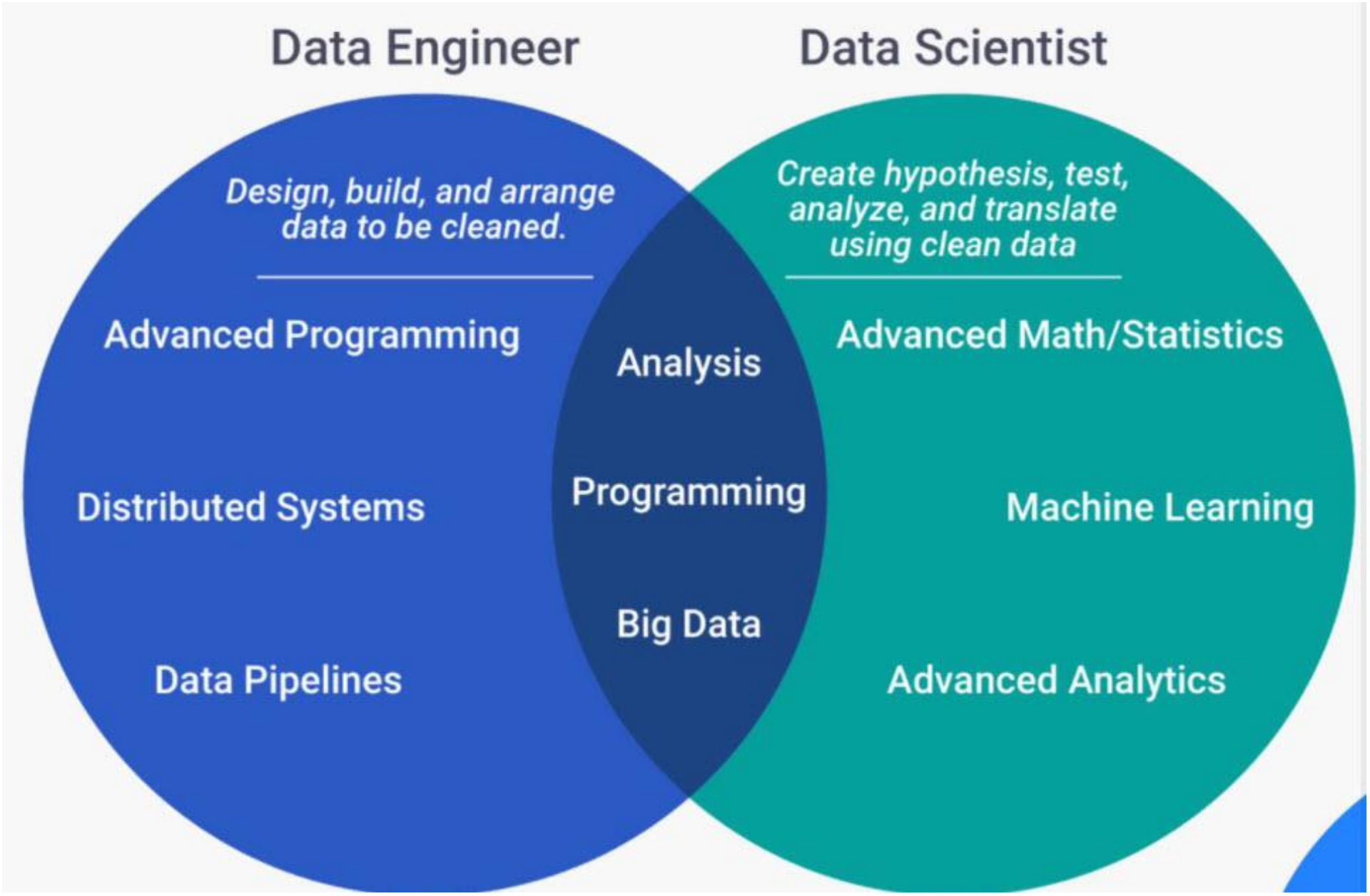
Machine Learning Engineer vs Data Scientist

Machine Learning engineer:

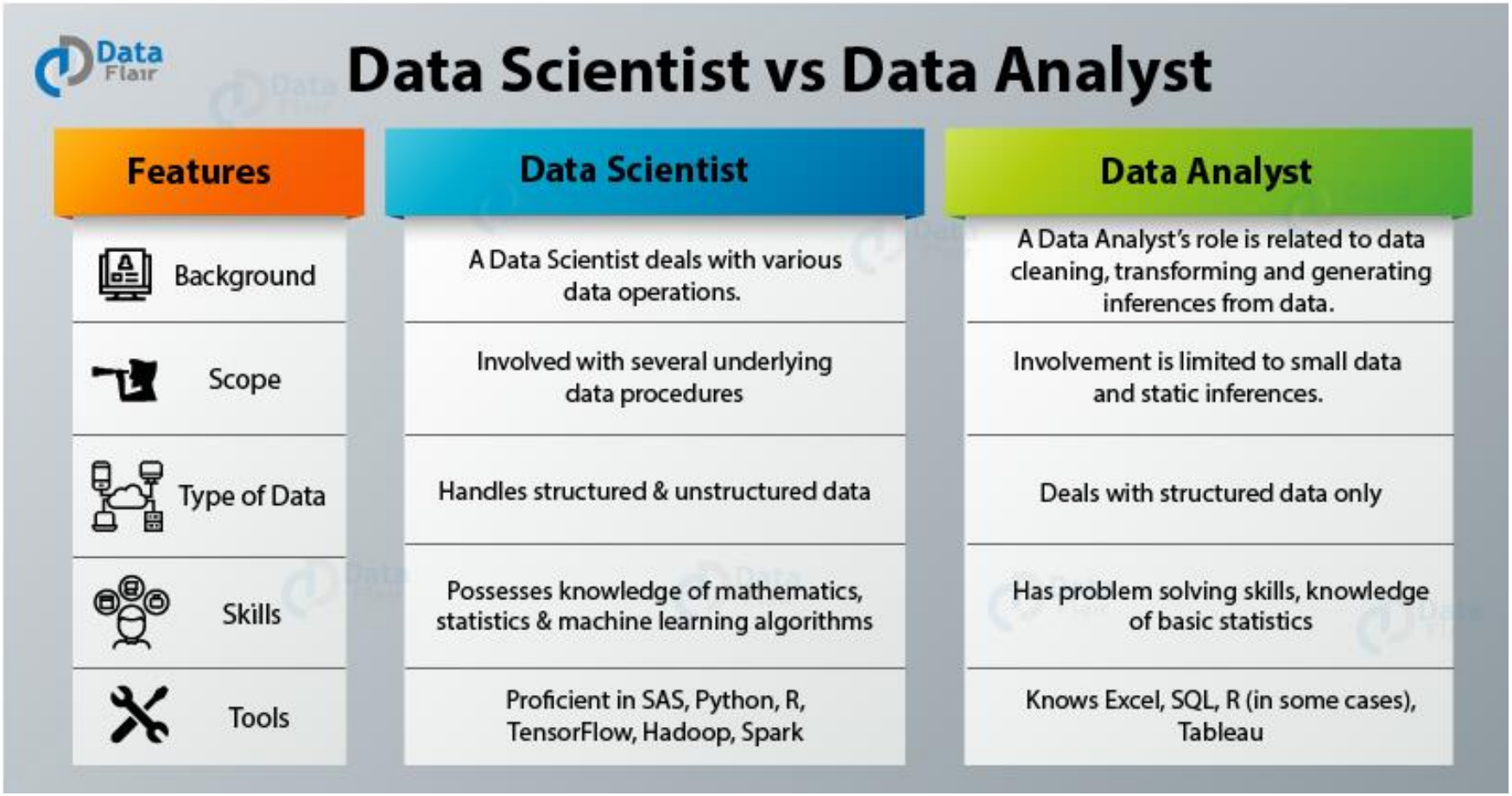
- Knowledge of Python programming, Keras, PyTorch etc.
- Data wrangling and APIs
- Supervised and unsupervised algorithms
- Statistics for AI
- Natural Language Processing
- Deep learning and computer vision

Data scientist:

- Statistical skills
- Programming languages
- Data visualisation
- Big data platforms
- Machine learning


Data Engineer
Data Scientist
Design, build, and arrange data to be cleaned.
Create hypothesis, test, analyze, and translate using clean data
Advanced Programming
Distributed Systems
Data Pipelines
Analysis
Programming
Big Data
Advanced Math/Statistics
Machine Learning
Advanced Analytics

Data Analyst



Data Analyst

Data Engineer

I am responsible for preparing the foundation that data scientist use for their work

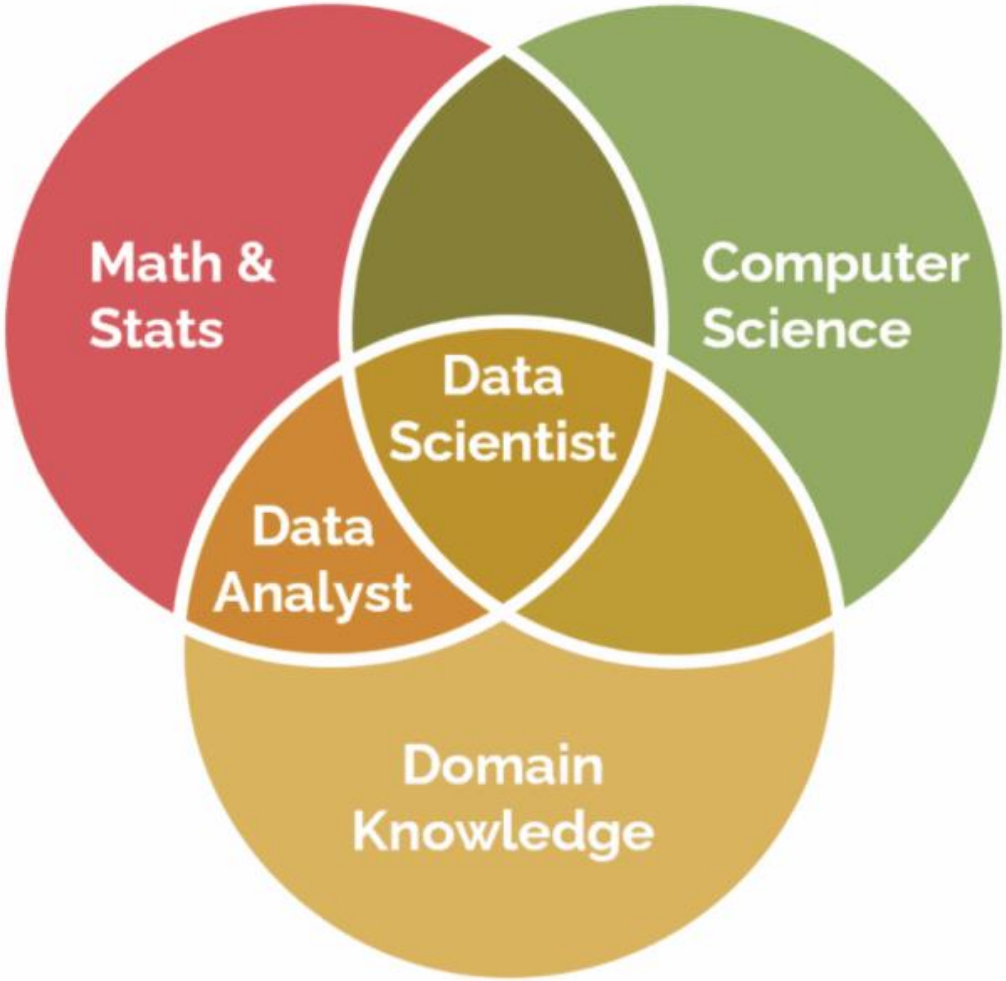
Data Scientist

I analyze data to identify patterns and trends to deliver recommendations for future

Data Analyst

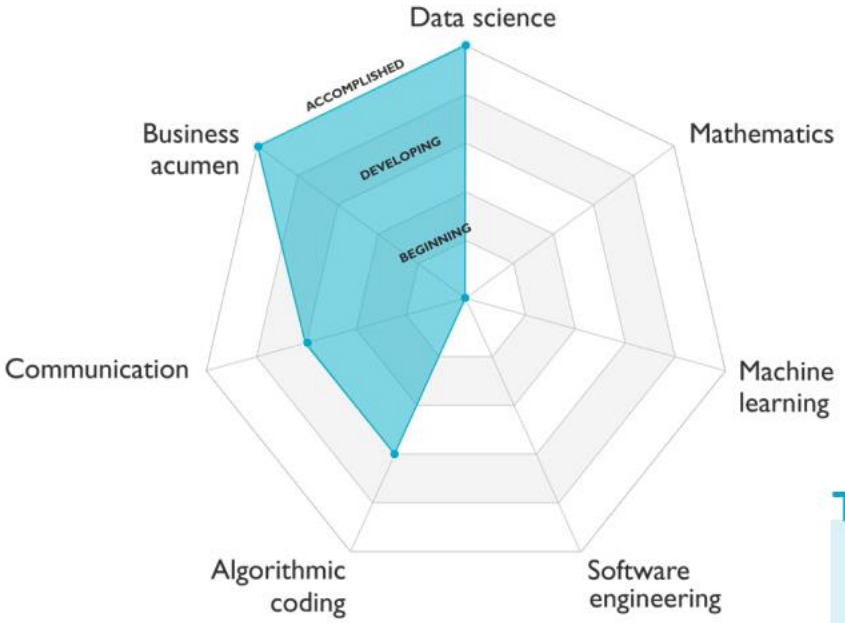
I analyze data to summarize the past in visual form

Data Analyst



Data Analyst

SKILLS



TOOLS

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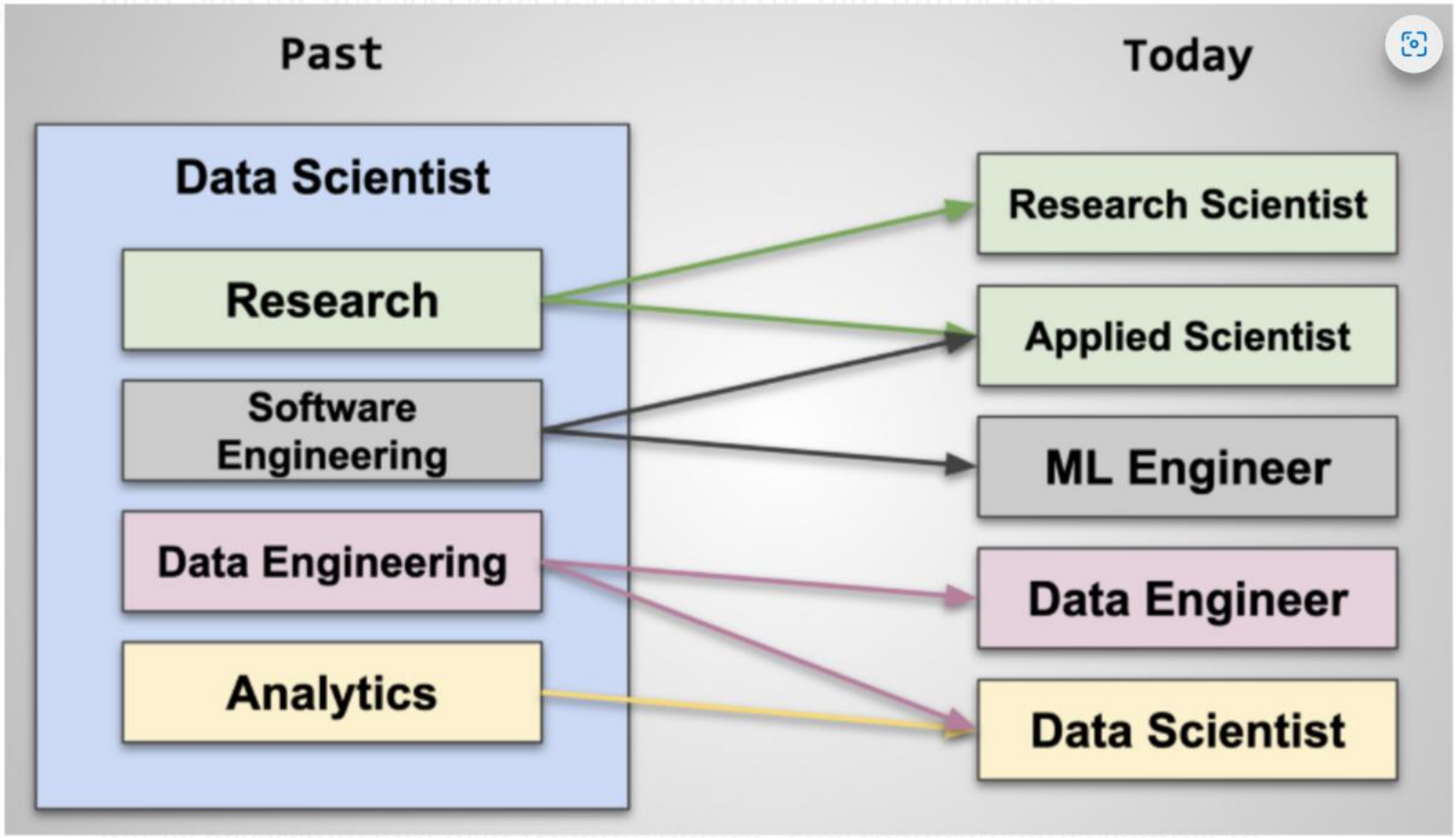
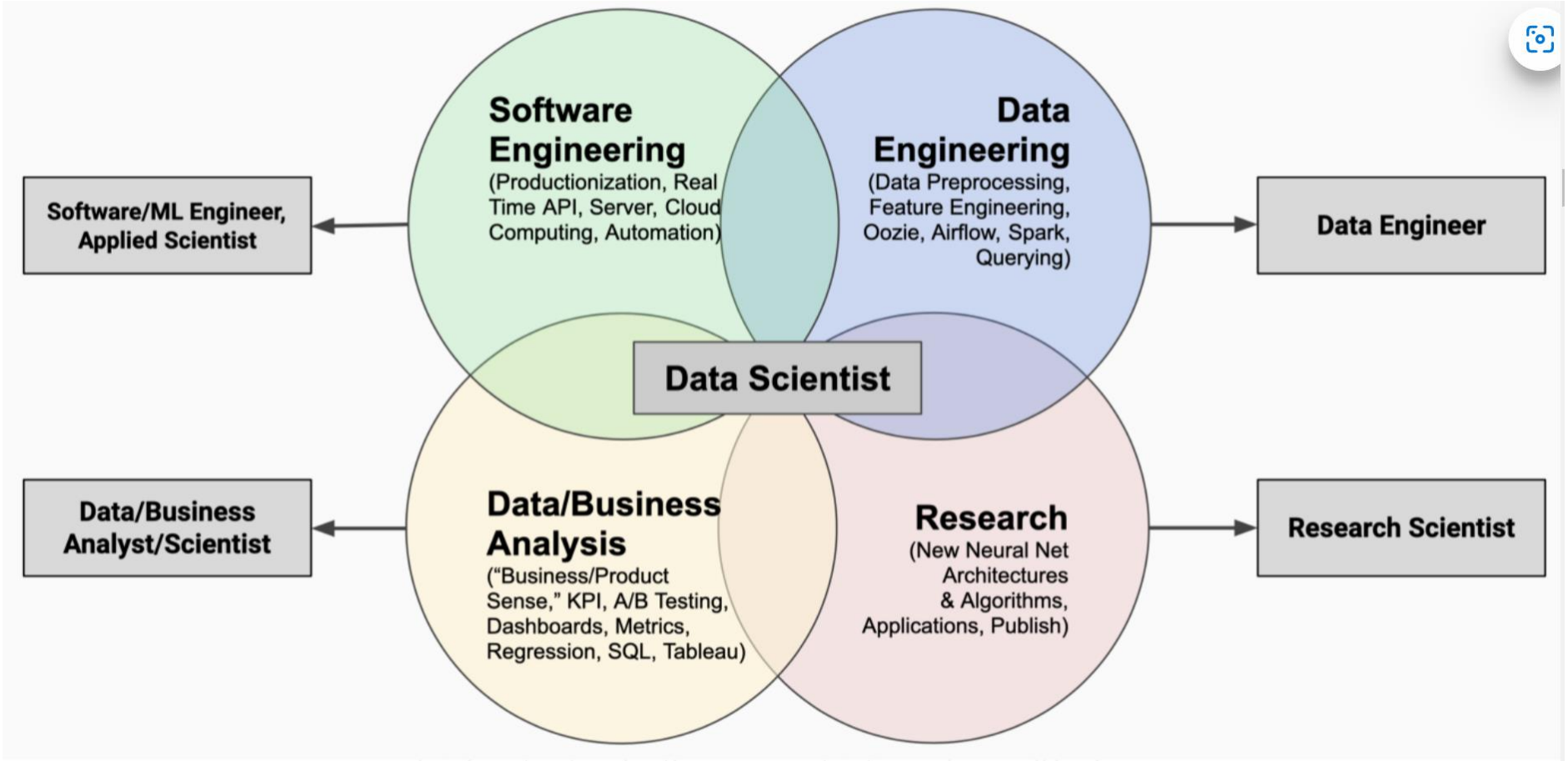
Machine learning Engineer



Machine learning Engineer



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- Programming languages
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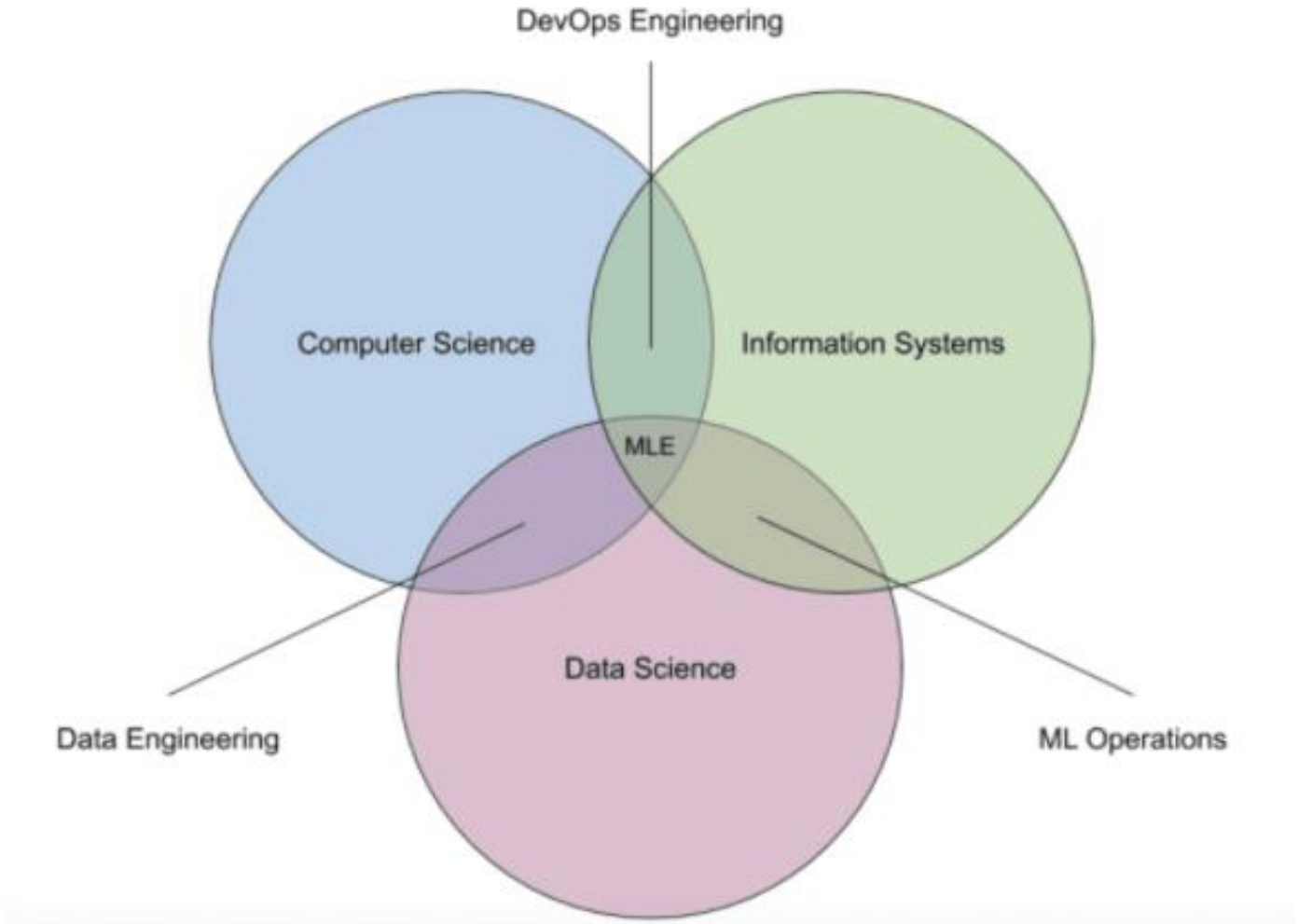
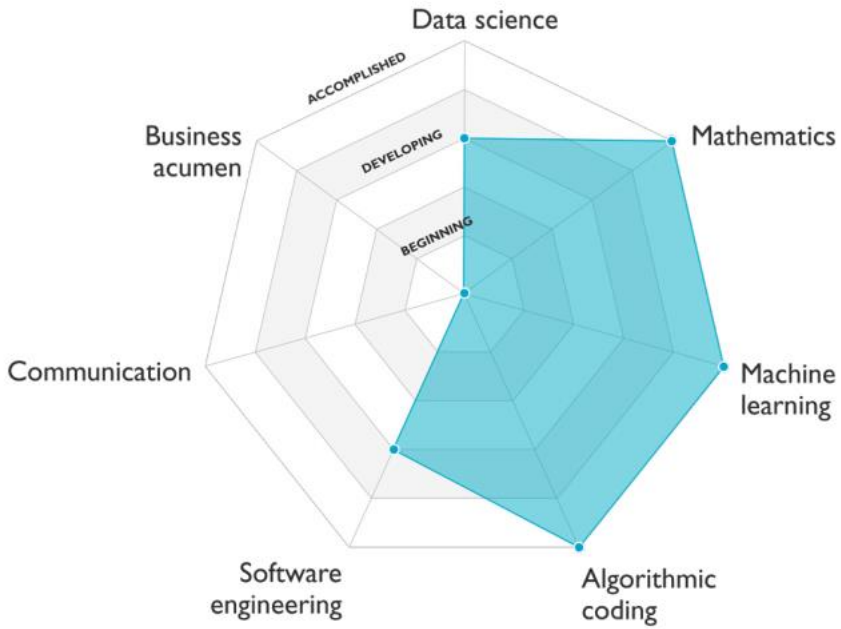
- Big data platforms
- Machine learning

Machine learning Engineer



Machine learning Engineer

SKILLS

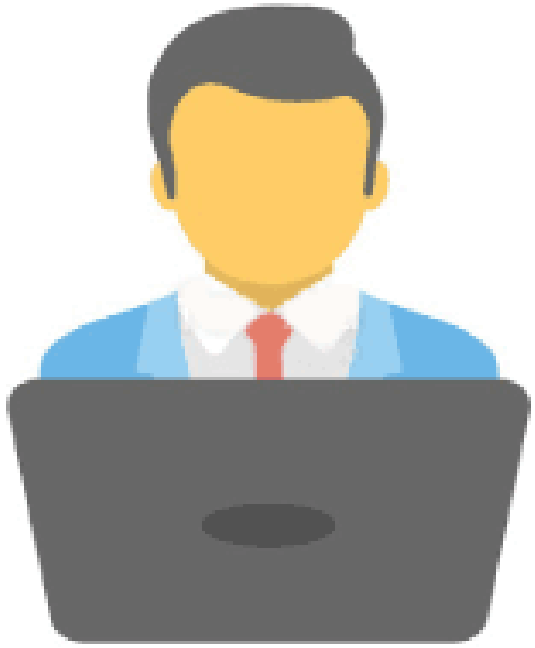


TOOLS

- **Data Engineering** in Python and/or SQL or other domain-specific query languages
- **Modeling** in Python using packages such as numpy, scikit-learn, TensorFlow, and PyTorch
- **Deployment** using an object-oriented programming language (such as Python, and Java, C++,) and cloud technologies such as AWS, GCP, and Azure
- **Collaboration and workflow** using a version control system (for instance, Git, Subversion, and Mercurial), a command line interface (CLI) like Unix, an integrated development environment (IDE) such as Jupyter Notebook, and Sublime, and an issue tracking product like JIRA

Software Development Team
Focused on developing a feature, product component, or an entire project.
Codes and then delivers the web or app developed software to the client.
VS
Support & Operations Team
The support team ensures the software development team product's functionality over time.
Is in charge of incident management, product testing, troubleshooting, bug fixing, monitoring and alerting, etc.
Cafeto

What is DevOps?

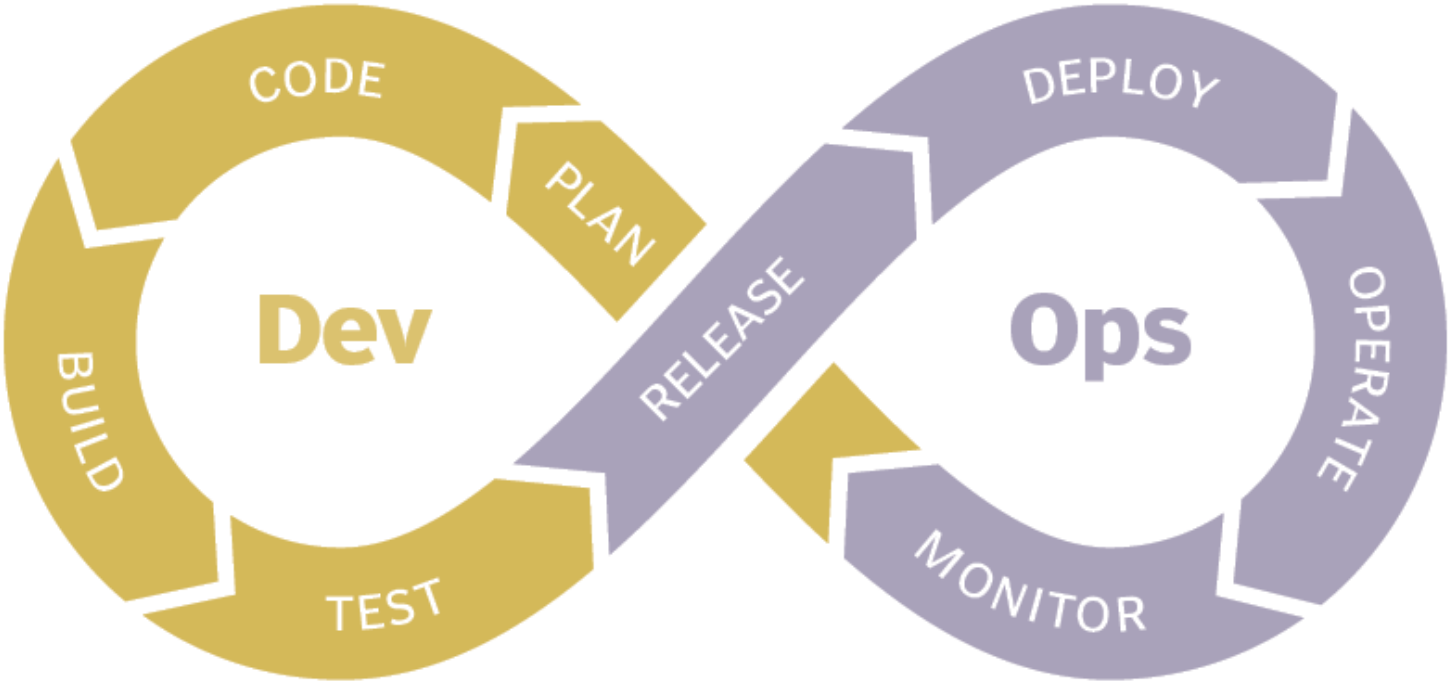


Developers & Testers

IT Operations

CODE
DEV
ops

DevOps infinity loop



From **Devops** to **MLOPS**

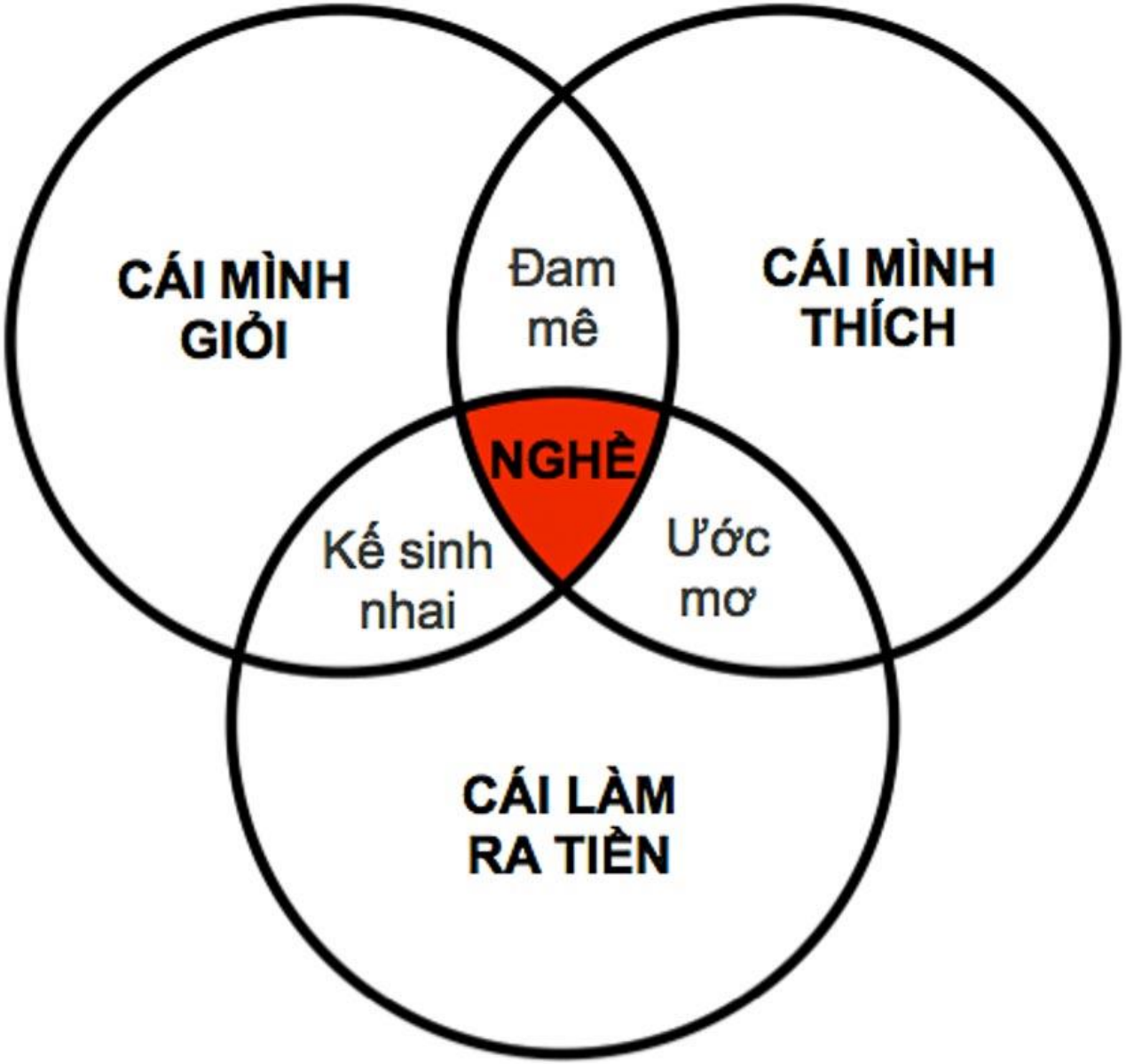
MLOps = ML + DEV + OPS

Develop

- Algorithm Training + Testing
- ETL (Data Pipelines)
- Continuous Integtation / Continuous Deployment

Operate

- Continuous Delivery
- Model Inference
- Monitoring and Management

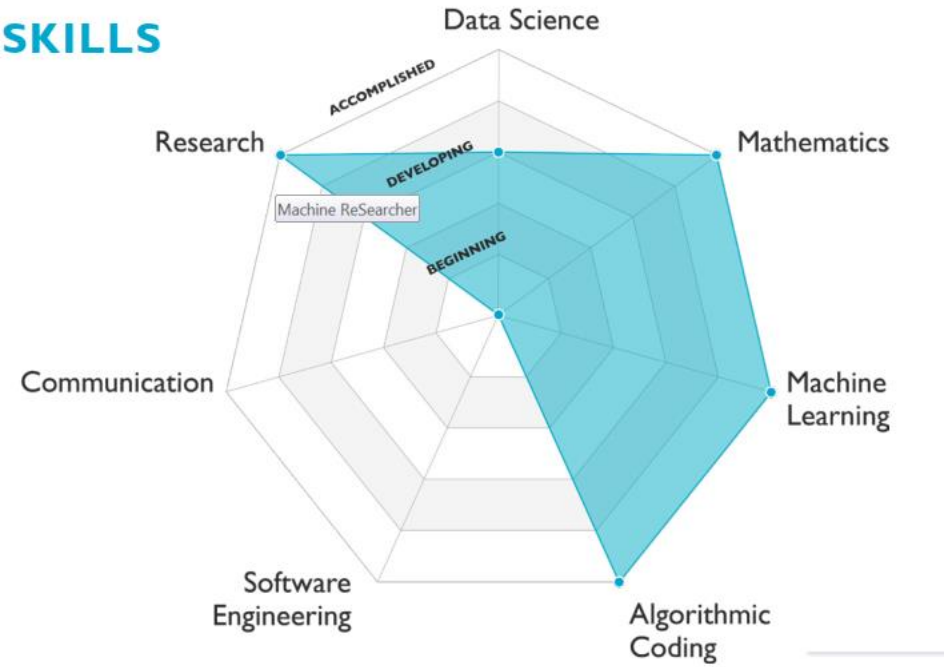

CÁI MÌNH GIỎI
Đam mê
CÁI MÌNH THÍCH
NGHỀ
Kế sinh nhai
Ước mơ
CÁI LÀM RA TIỀN

Machine learning ReSearcher

Machine learning research is really all about the *science*. A machine learning researcher is trying to push the boundaries of science, specifically in the field of Artificial Intelligence. These people typically have a Masters or PhD in CS and have many publications in top machine learning conferences. They're super popular in the research space!

Machine learning ReSearcher

SKILLS



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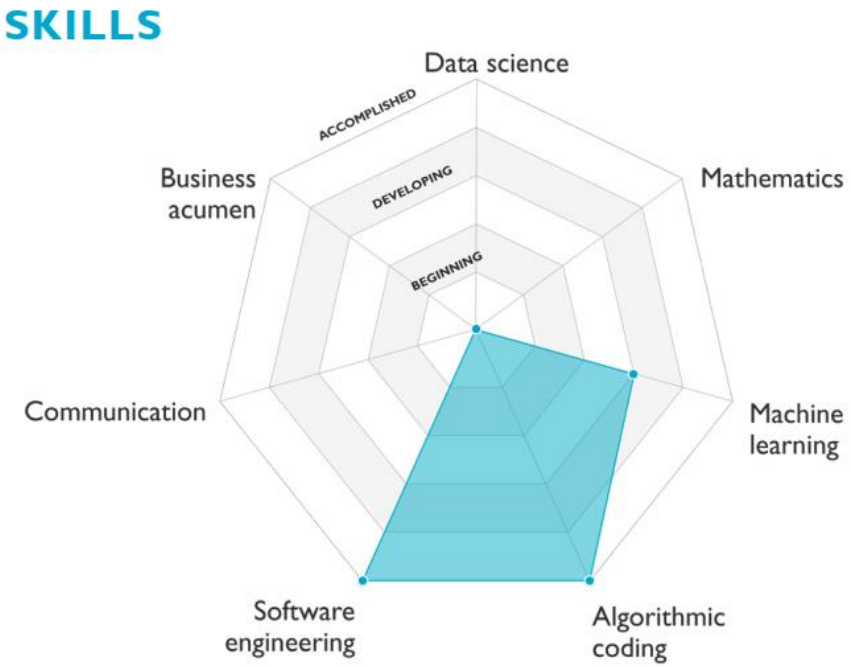
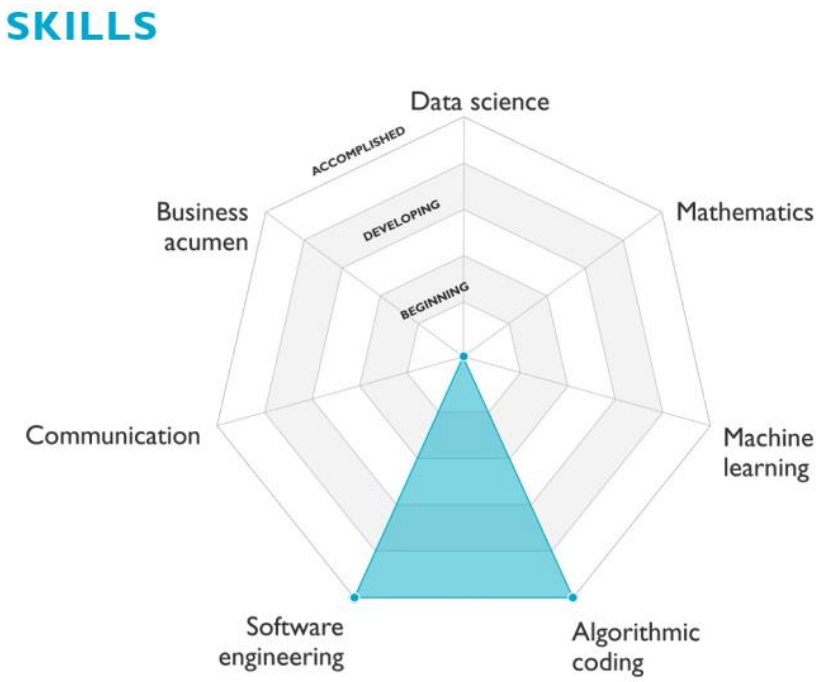
- **Research** by following updates via channels such as Twitter, Reddit, Arxiv, and conferences such as NeurIPS, ICLR, ICML, CVPR, and ACM

Software Engineer -Machine Learning VS Software Engineer





Software Engineer -Machine Learning VS Software Engineer

TOOLS

- **Modeling** in Python using packages such as numpy, scikit-learn, TensorFlow, and PyTorch
- **Data engineering** in Python and/or SQL (or other domain-specific query languages)
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