INFH 5000 – TA Presentation

Data Science in Action: Insights from Industry and Academia

Present by Changlun LI, INFH-DSA-PhD Student

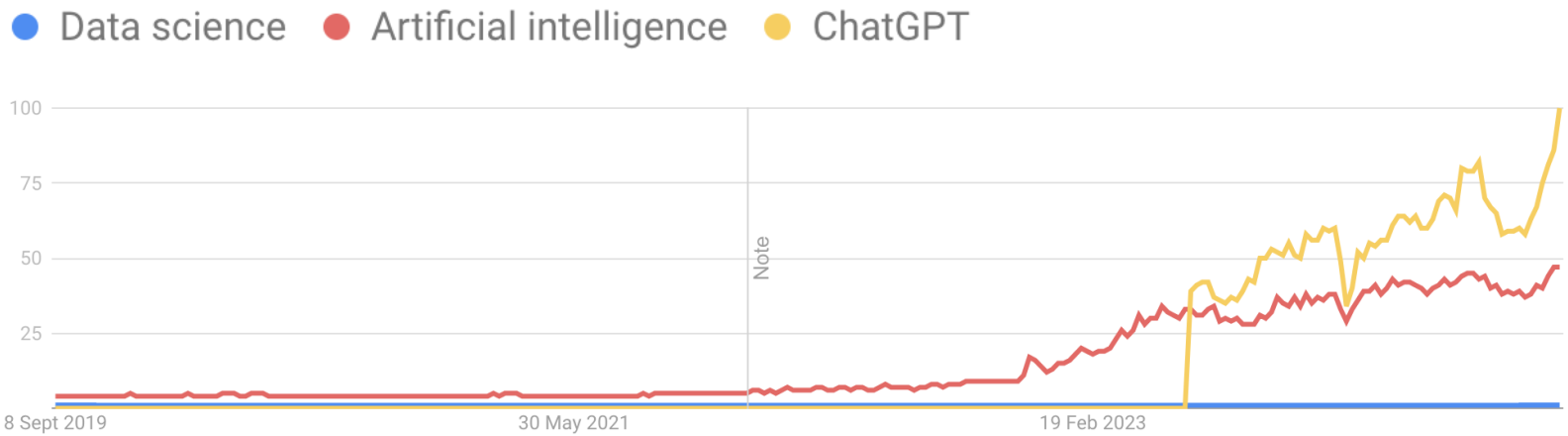
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY (GUANGZHOU)

Overview

Data Science Bootcamp	Definition Evolution
Industry Viewpoint	Project lifecycle Career outlook
Academy Viewpoint	Education Trending Research
Motivation	Community Tools

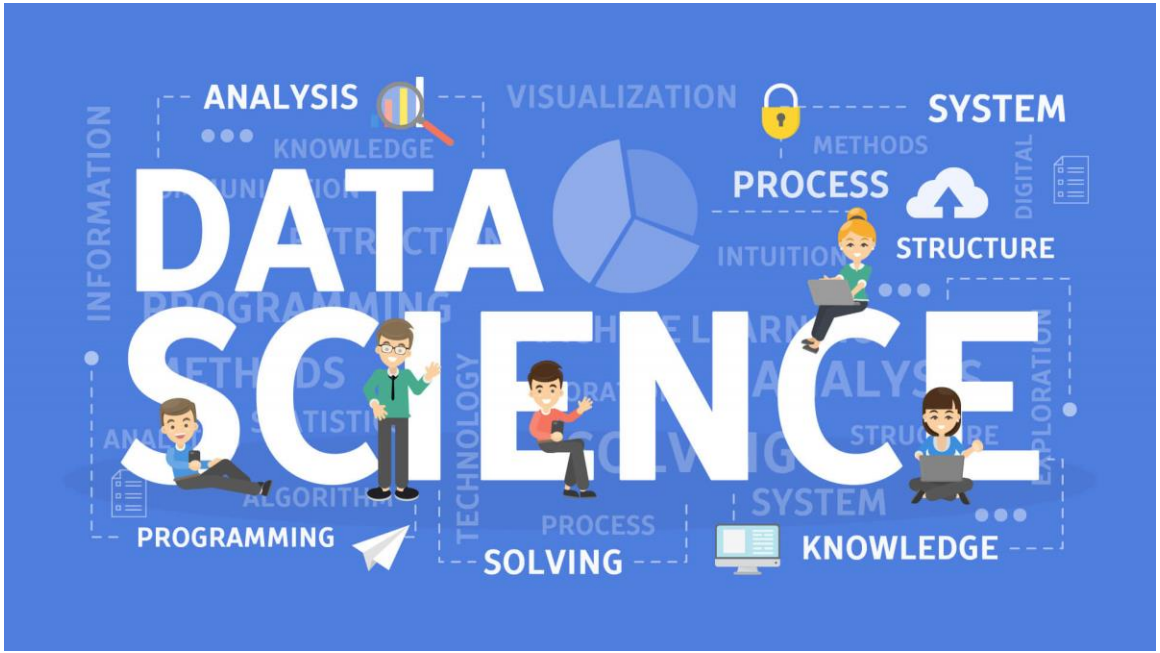
Remark: All images in the following slides credit to Google Images.

“Data Science” on Google Trends



Any observation?

What is Data Science?



IBM

Data science combines math and statistics, specialized programming, advanced analytics, AI and ML with specific subject matter expertise to uncover actionable insights hidden in an organization's data.

The Evolution of Data Science

- 20th century: Statistics and early data analysis methods.
- 2000s: Rise of big data and machine learning.
- Today: AI and deep learning advancements.
- Major turning points: cloud computing, IoT, big data, LLM.

Distinct Objective and Focus

Industry

- **Outcome-Driven:** The primary goal is to drive business value, such as increasing profits, and improving customer experience.
- **Practical Application:** Tools and methods are chosen based on their ability to provide quick and effective solutions.
- **Performance Metrics:** Success is often measured in terms of business metrics like return on investment (ROI), customer penetration rates, or KPIs.

Academia

- **Knowledge-Driven:** The focus is often on advancing theoretical understanding and developing new methodologies.
- **Research and Innovation:** Strong emphasis on creating novel, generalizable approaches that can contribute to the broader scientific community.
- **Publication and Peer Review:** Success is typically measured by the quality and quantity of published research, citations, and contributions to academic knowledge.

Data Science in Industry

From Industry

The accelerating volume of data sources, and subsequently data, has made data science one of the fastest-growing fields across every industry.

Organizations are increasingly reliant on data experts to interpret data and provide actionable recommendations to improve business outcomes.

How do Business Embrace Data Science?

Business operation emphasizes data-driven decision-making and investing in infrastructure.

It follows a typical project lifecycle in the industry, which involves moving from problem identification to solution deployment.

When assessing production, it's important to consider KPIs, cost savings, and revenue generation.

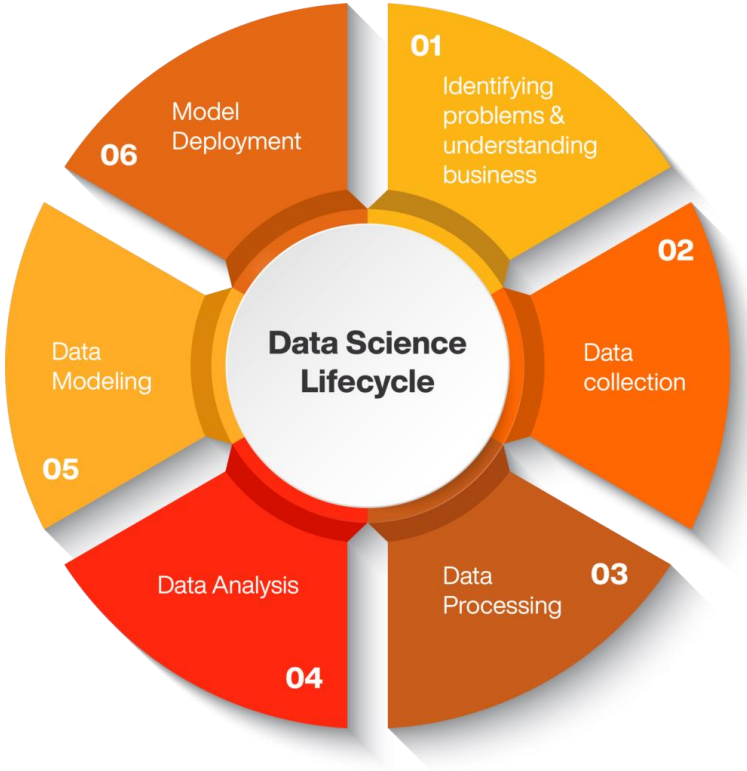
Challenges may arise from a need for business understanding, data quality, and privacy concerns.

Data Science Lifecycle

A data science lifecycle is defined as the iterative set of data science steps required to deliver a project or analysis.

There are no one-size-fits that define data science projects. Hence you need to determine the one that best fits your business requirements.

Each step in the lifecycle should be performed carefully. Any improper execution will affect the following step, ultimately impacting the entire process.



However, it might happen…

Data Science Job Market

Data Analyst

Data Engineer

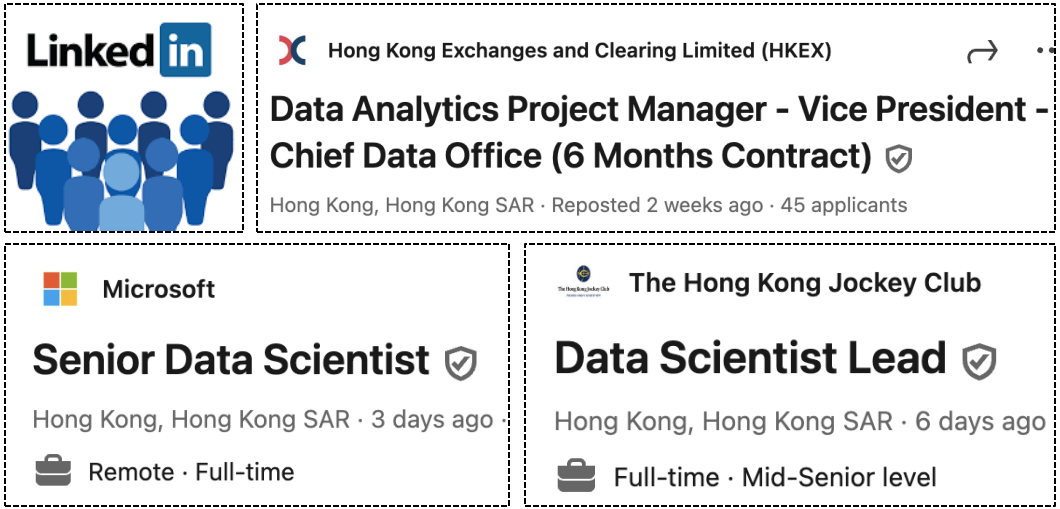
Data Scientist

ML/DL Engineer

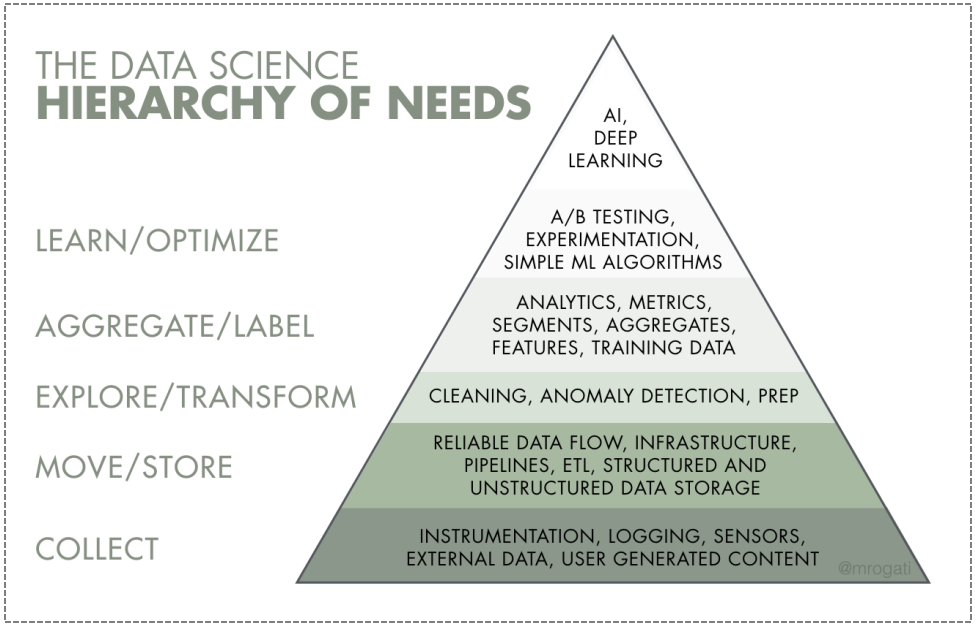
Data Product Manager

Chief Data Officer

More…



Hierarchy of Needs



For medium/large company:

- Machine Learning Engineer
- Data Scientist
  Data Analyst
- Data Engineer
- Data Infrastructure Engineer

What about a small company or even a start-up? Everything!

Voice: The 3 biggest problems with Data Science

Cassie Kozyrkov, Google (former) Chief Decision Scientist

Link: https://www.youtube.com/watch?v=kjzDo5f7Ecc

Quick Recap: What are the problems?

MAKE: Who makes data useful? A well-organized company structure for data scientists and other roles.

DATA: Data should be usable then can be useful. The data engineering team should process large-scale of data at first, then the data science team can help with it.

USEFUL: Who makes the decision? Data science team needs skilled decision maker and business leader.

Tips when looking for a job:

- ✓ Carefully go through the job post and check if the job duties are clear.
- ✓ Think about the team's organization and leadership.
- ✓ Dare to try new stuff and learn by doing.

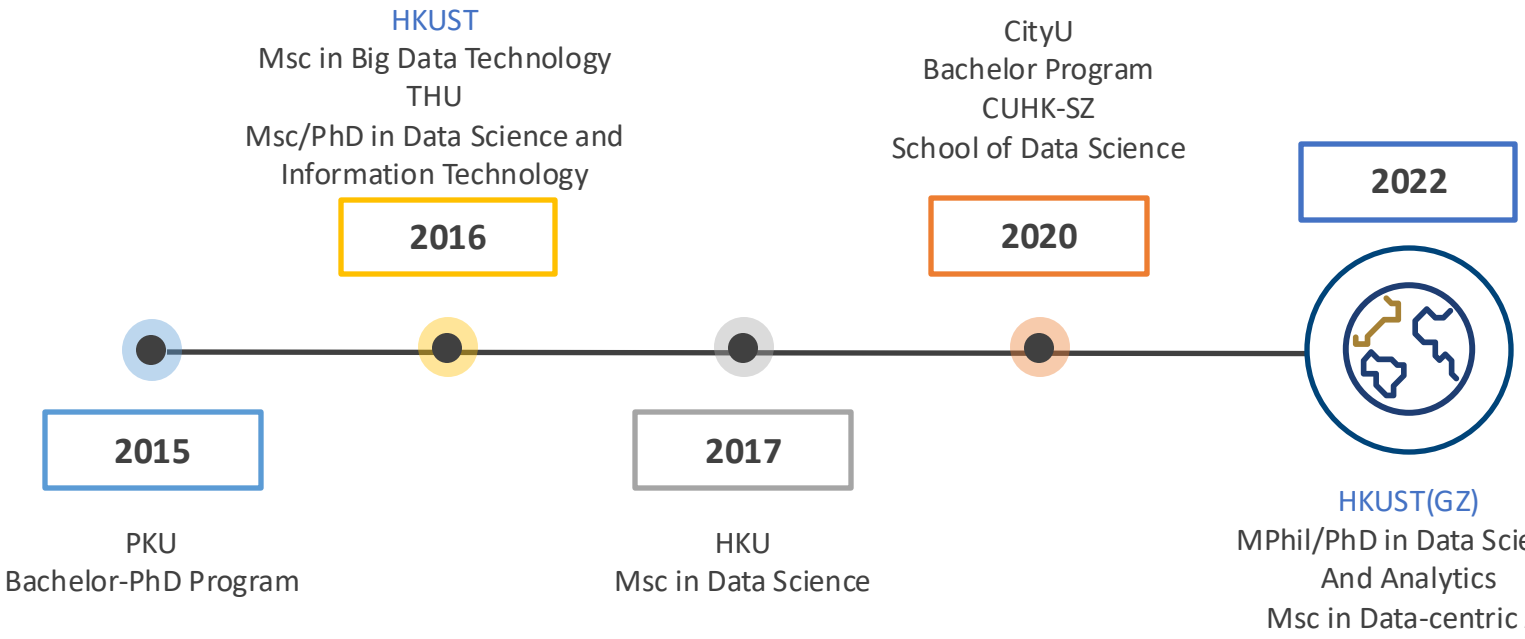
Data Science in Academia

香港科技大学(广州)
THE HONG KONG
UNIVERSITY OF SCIENCE AND
TECHNOLOGY (GUANGZHOU)

数据科学与分析学域
DATA SCIENCE AND ANALYTICS THRUST
信息枢纽
INFORMATION HUB

Growing demand for Data Science Education

Mainland China & Hong Kong



Data Science Research

Top conferences:

KDD, SIGIR, ICDE, SIGMOD, WSDM, VLDB, ACL, ICML …

Trending topics:

Good data for AI (a.k.a. data-centric AI)

AI for Good data (preparation & cleaning)

Data visualization

Harness LLM

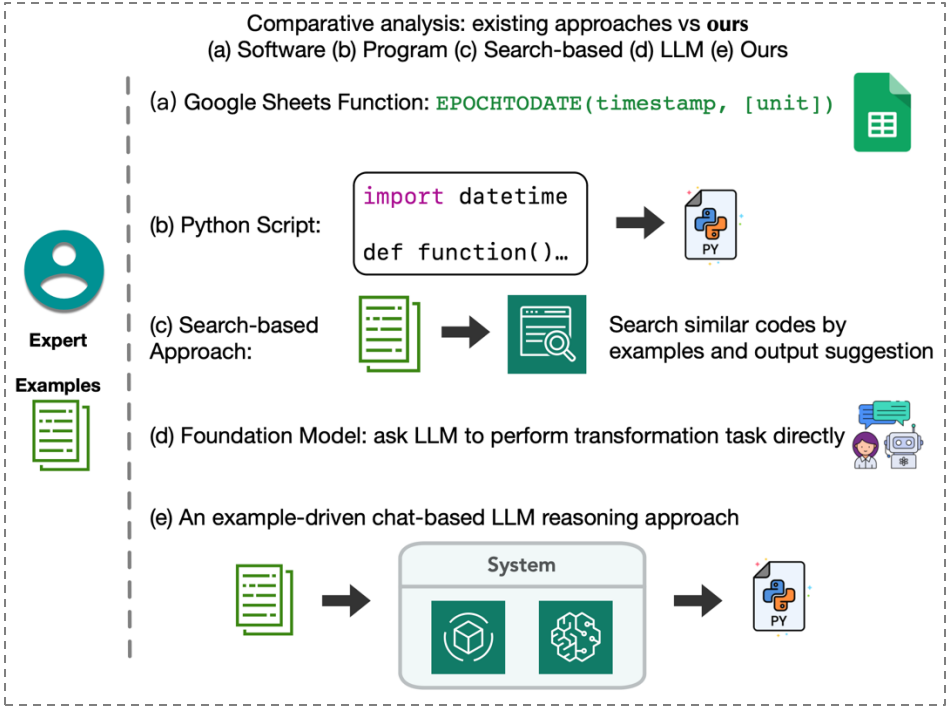
More …

My Research

Focus on chat-based data preparation solutions using the Large Language Models.

Below are some examples:

- LLM-based Missing value imputation
- Chat-based EDA
- Data Transformation



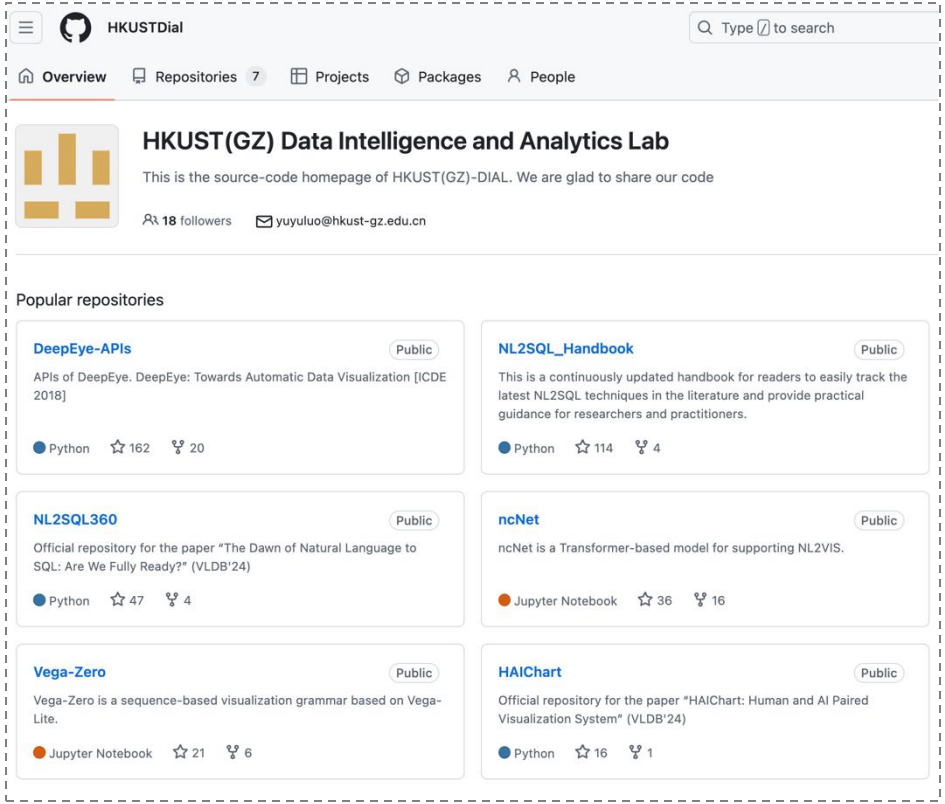
Our Lab Research

Data Intelligence and Analytics Lab, DIAL@HKUST(GZ)

We aim to reduce overhead in the world of data science and lower the human cost, such as:

- NL2SQL
- Table retrieval and analysis
- Data Preparation
- RAG meets LLM
- Visualization

https://github.com/HKUSTDial



Motivation: Why I Choose DSA?

Bottlenecks occurred at work		
Accumulated long TODO list but seldom handled	Dealing with clients occupied the major schedule	Human resource shortage, especially developer

Transition to academia		
Professional supervision and self-paced learning	Collect problems from the industry	Explore solutions by doing my research

GET HANDS DIRTY

Community

kaggle stackoverflow

Online Courses

Tool & Library

mlr OpenAI H2O learn Keras PyTorch TensorFlow OpenCV spaCy

sas tableau KNIME alteryx

ggplot2 Shiny readr tidyr dplyr pandas matplotlib NumPy Seaborn plotly SciPy statsmodels

jupyter git GitHub Studio

python SQL R Scala HTML CSS JS TS C# Java GO R

SVELTE Python APOLLO Flask Express SQLAlchemy node heroku Firebase

Spark DASK Airflow PREFECT presto PostgreSQL mongoDB redis MySQL cassandra kafka ORACLE DATABASE elastic

aws Azure


Thank You!