

Stanford·CS520 | Knowledge Graphs (2021)

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CS520: KNOWLEDGE GRAPHS

Data Models, Knowledge Acquisition, Inference, Applications

Lectures and Invited Guests

Spring 2021, Tu/Thu 4:30-5:50, [cs520.Stanford.edu](https://cs520.stanford.edu)

**Learn about the basic concepts,
latest research & applications**

Knowledge Graphs Seminar

- What is a Knowledge Graph?
- How to Create a Knowledge Graph?
- How to Reason with and Access Knowledge Graphs?
- Applications
- Implementation Tools
- Future Research

How do Knowledge Graphs Relate to AI?

Outline

- Knowledge Graphs as a Test Bed for AI
- Graph Data Science
- Knowledge Graphs for the ultimate vision of AI

Knowledge Graphs as a Testbed for AI

- Two-way symbiosis
 - Knowledge Graphs enable many AI applications
 - AI algorithms can be used to create Knowledge Graphs

Knowledge Graphs as Enablers of AI

- Knowledge Graphs enable
 - A personal assistant to get more things done
 - A recommendation system to offer better recommendations
 - A search engine to answer questions

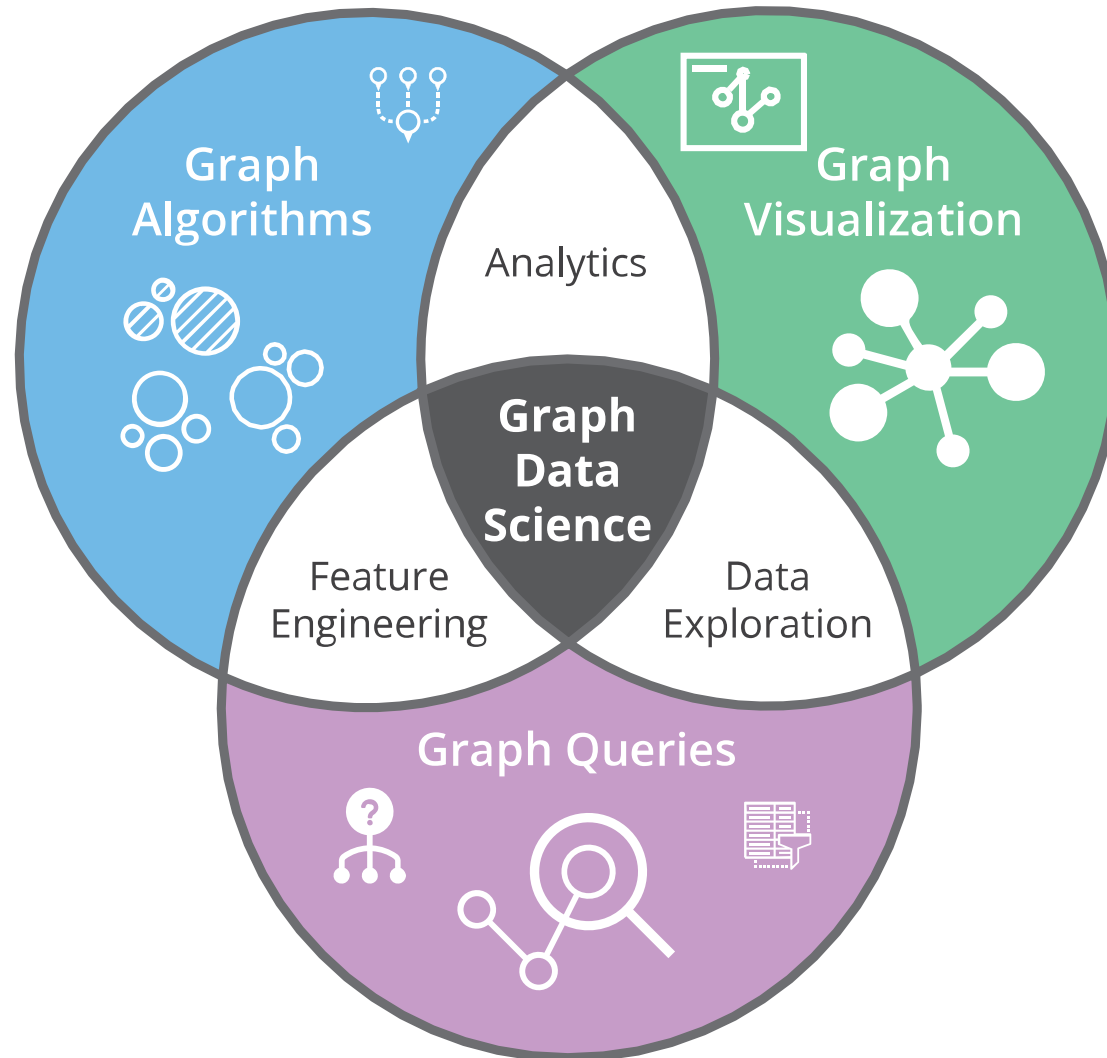
AI as an Enabler for Knowledge Graphs

- Machine learning / NLP algorithms play a central role in
 - Schema mapping entity linking
 - Entity and relation extraction
 - Data cleaning and anomaly detection
 - Inference and question answering

Graph Data Science

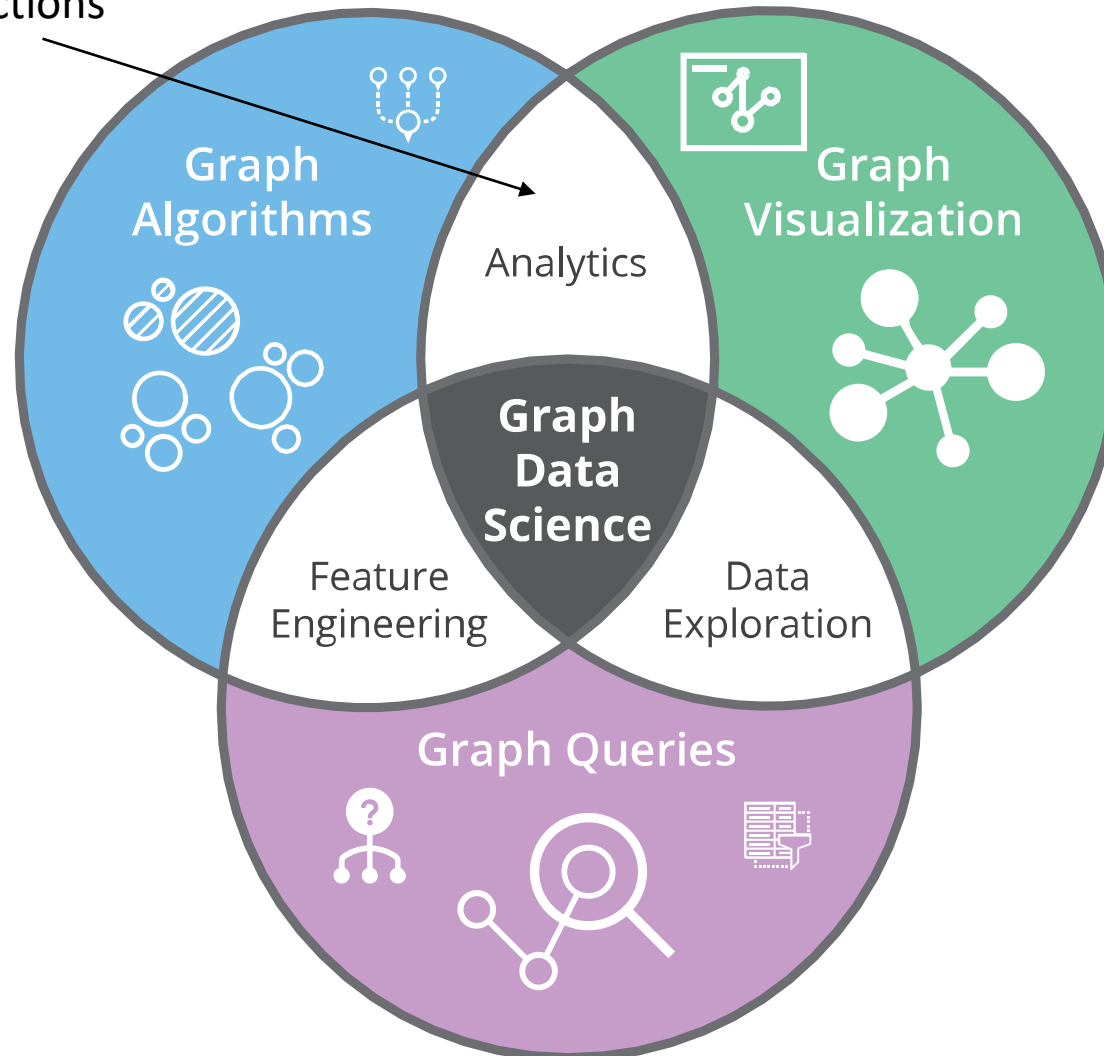
- Availability of huge amount of data
- Derive knowledge from the structure in data

Graph Data Science



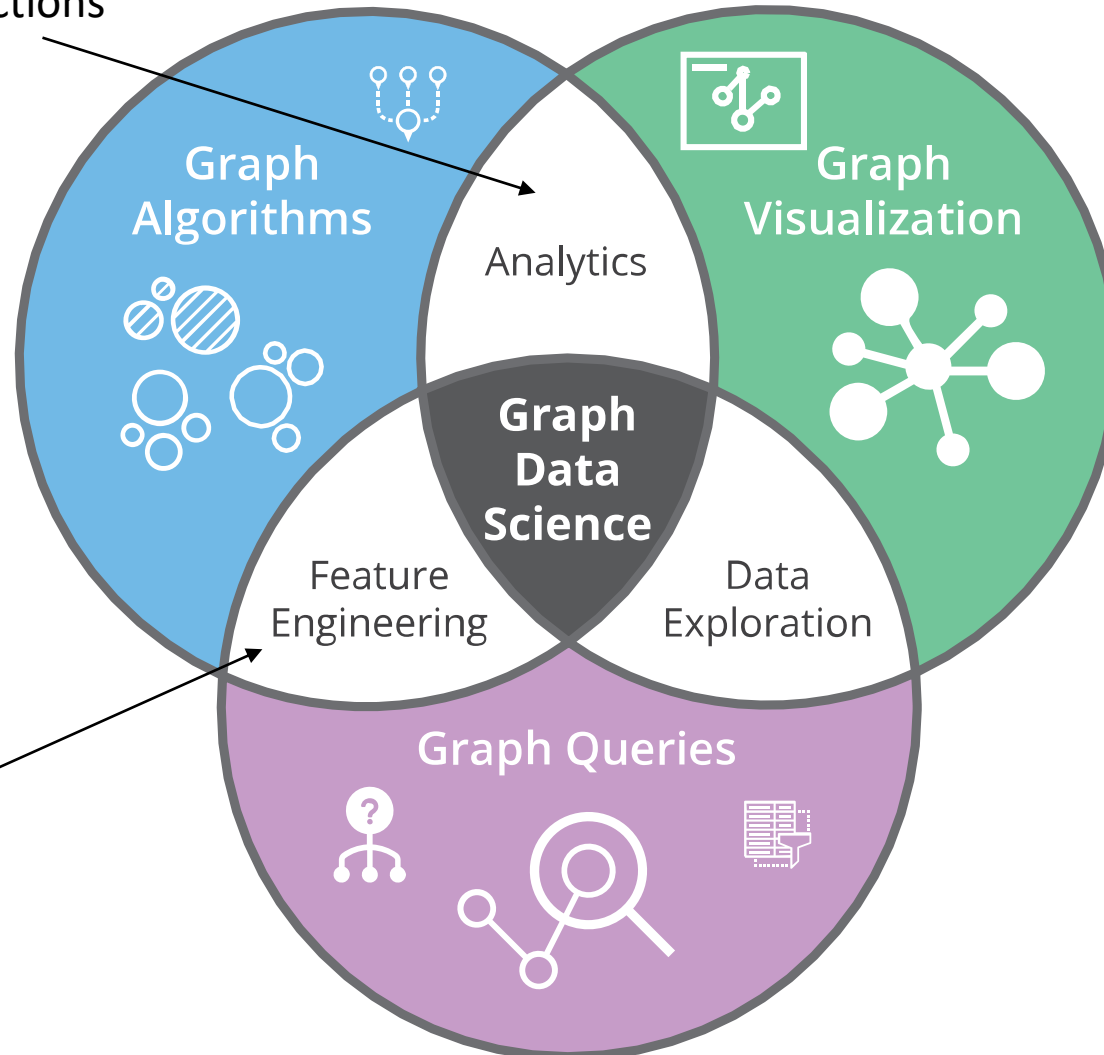
Graph Data Science

Use Machine Learning for Predictions



Graph Data Science

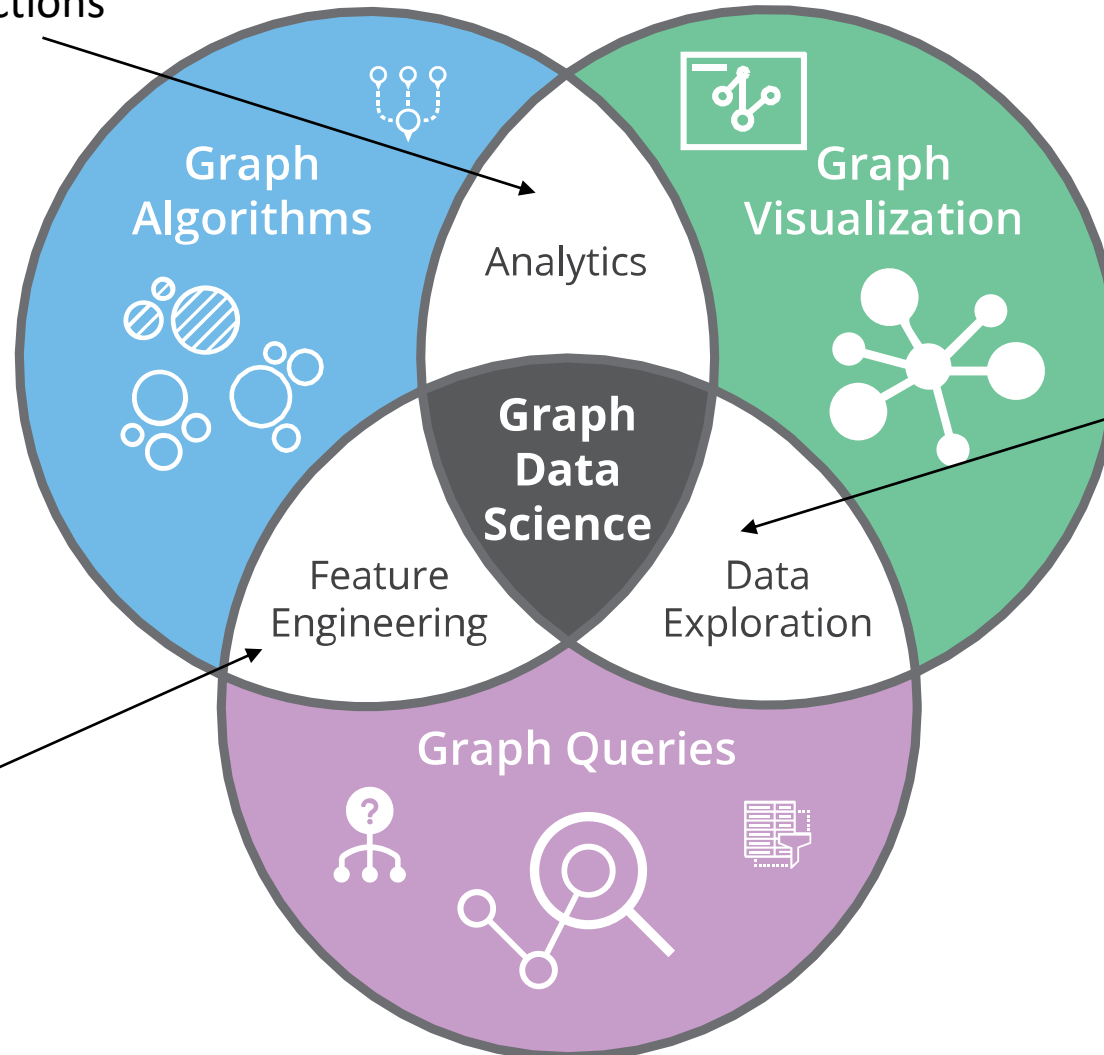
Use Machine Learning for Predictions



Requires Feature Engineering

Graph Data Science

Use Machine Learning for Predictions



User Experience for Large Datasets

Requires Feature Engineering

Knowledge Graphs for AI

- Knowledge Graphs have been used in AI since the beginnings
 - Semantic networks
 - Description Logics
 - Rule Languages
 - Graphical Models

Knowledge Graphs for AI

- But Knowledge Acquisition has been an equally central concern
 - Semantic networks
 - Description Logics
 - Rule Languages
 - Graphical Models

Knowledge Engineering
Inductive Learning
Machine Learning

Knowledge Graphs for AI

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Knowledge Engineering

Inductive Learning

Machine Learning

Scale

Bottom-up construction

Mixed modes of construction

Knowledge Graphs for AI

- But Knowledge Acquisition has been an equally central concern

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Knowledge Engineering

Inductive Learning

Machine Learning

Scale

Bottom-up construction

Mixed modes of construction

Small scale intelligence

Top-down design

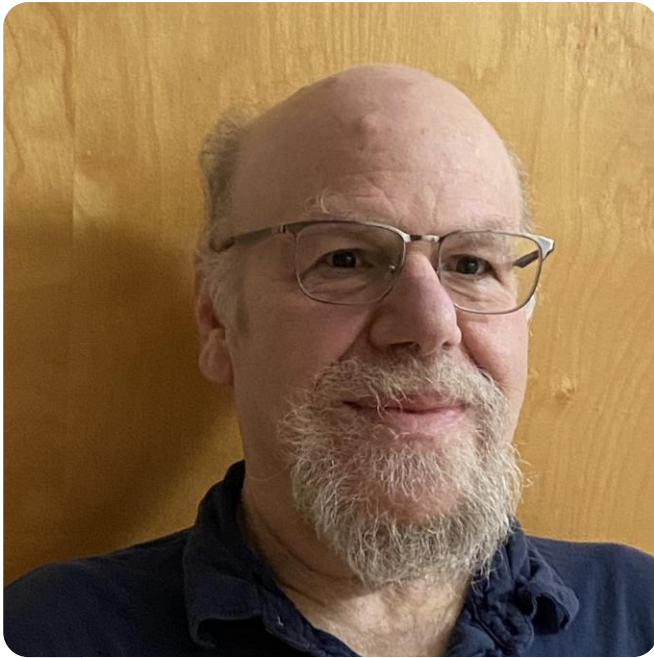
Ability to write what you know

Knowledge Graphs for AI

- But Knowledge Acquisition has been an equally central concern
 - Semantic networks
 - Description Logics
 - Rule Languages
 - Graphical Models

Knowledge Engineering
Inductive Learning
Machine Learning

Programs that have a model of the domain, formulate a hypothesis, design an experiment, provide explanations, remain an open challenge for AI



Prof. James A. Hendler
Semantics for scaling the Knowledge Graphs



Dr. Douglas Lenat
Knowledge Graphs++

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