CS520: KNOWLEDGE GRAPHS

Data Models, Knowledge Acquisition, Inference, Applications

Lectures and Invited Guests

Spring 2021, Tu/Thu 4:30-5:50, 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

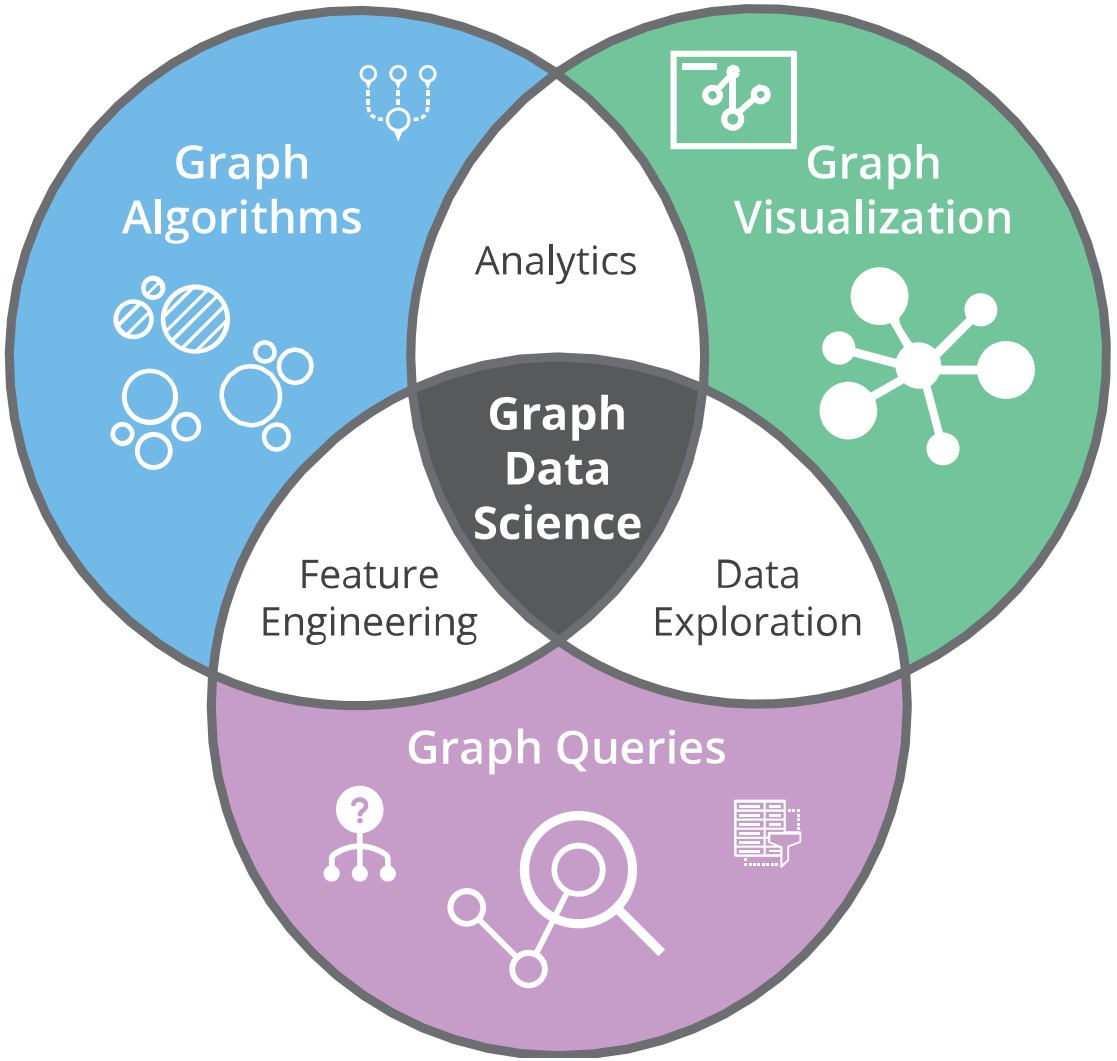
AI as an Enabler for Knowledge Graphs

- 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

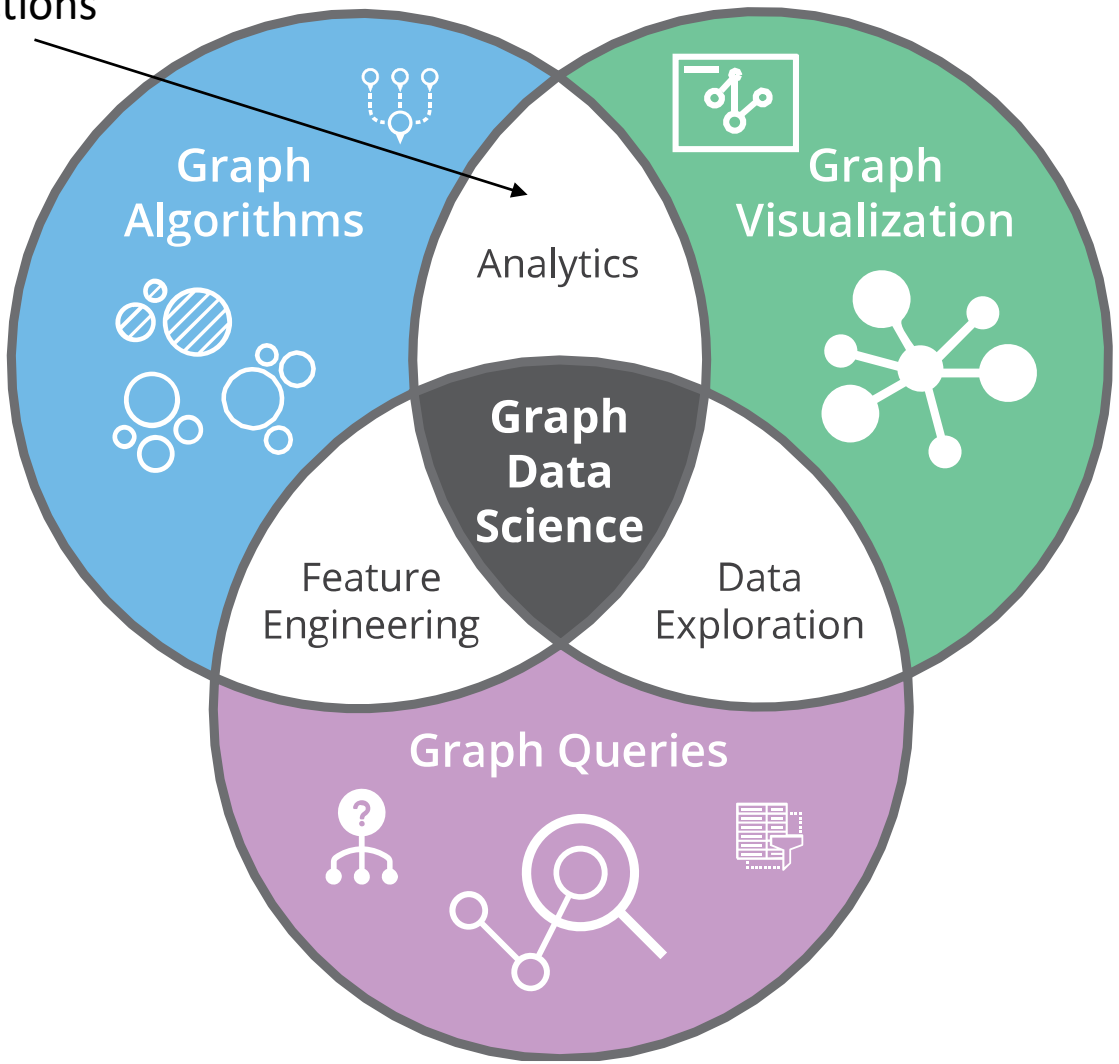
- Availability of huge amount of data
- Derive knowledge from the structure in data

Graph Data Science



Graph Data Science

Use Machine Learning for Predictions



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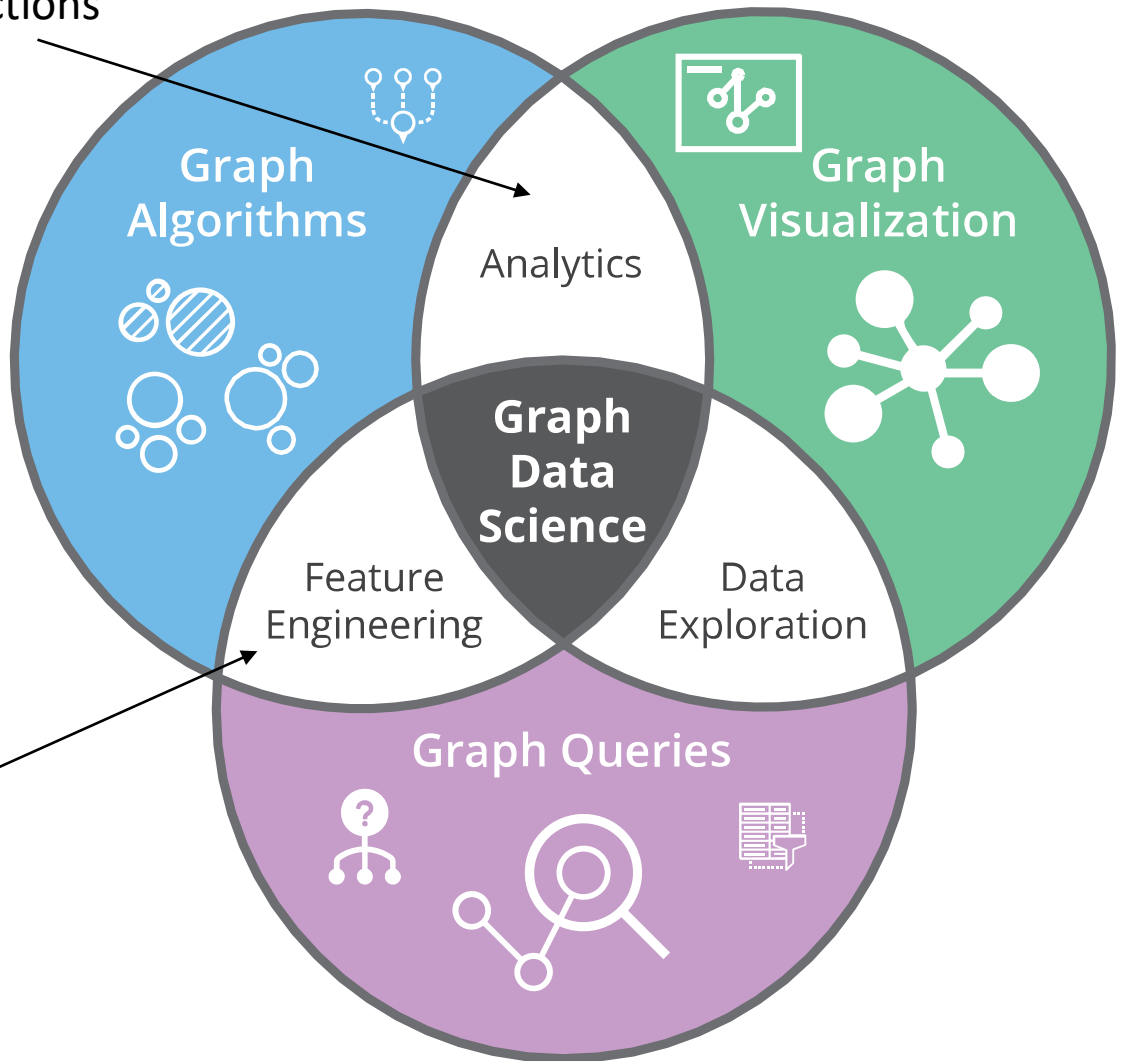
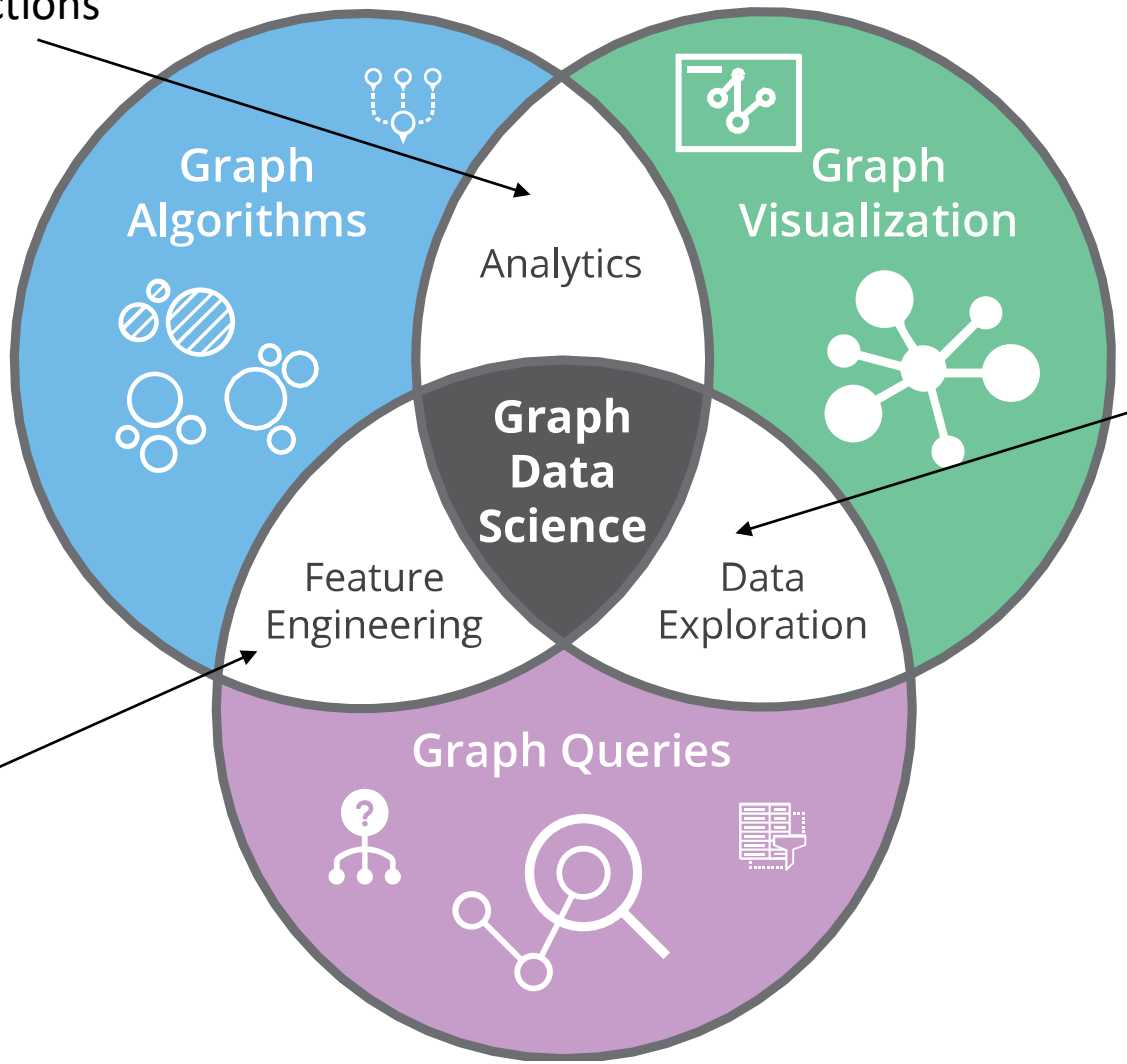


Requires Feature Engineering

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
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Knowledge Engineering
Inductive Learning
Machine Learning

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Knowledge Engineering
Inductive Learning
Machine Learning

Scale
Bottom-up construction
Mixed modes of construction

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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

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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++