**Introduction**

**Machine Teaching** is a collection of approaches explicitly aimed at solving the difficulties that lie in enabling domain experts to effectively teach machine learning systems.

AI Systems, including agents like Jill Watson, face significant challenges in adapting to new domains.

- How can we rapidly teach Jill Watson to adapt to new domains i.e. new courses?
- What sort of rich interfaces can be designed to facilitate Machine Teaching on the part of domain experts?

**Interactive Knowledge-Augmented Machine Teaching**

Agent Smith works through operating on 2 distinct inputs:

- **The Domain Knowledge Base** holds concepts and connections that form the body of knowledge the Jill Watson Agent seeks to explain.
- A **Distilled set of Question Templates** that represent the structural form of questions asked by users about this domain.

Agent Smith combines these two inputs, and creates large datasets of examples questions to rapidly train new Jill Watson Agents.

**Agent Smith**

- Domain Knowledge Base
- Typology of Questions from Domain

**Agent Smith In Action**

**Collected Student Questions**

- Is there any specific version of python we should be using?
- When does the project have to be turned in?

**Human Designed Templates**

- Unigram Frequency
- Bigram Frequency
- Trigram Frequency
- Stemming and Lemmatization

**Question Pattern Analysis**

- Can you give an explanation for (object)?
- Will we have to use (object) in this class?

**Template Questions**

- What is the release date for (object)?
- When can I start on (object)?
- On what day will (object) be available?

**Takeaways and Motivation for Knowledge-aided MT**

- Agent Smith reduces the estimated time cost of the development of a new Jill Watson agent to ~25 person hours.
- Deployed and used in more than 20 course deployments over the past few years in the OMSCS program.
- **An opportunity:** Better teaching interfaces and data augmentation approaches that allow domain experts to more easily configure a Machine Teaching system to build Q&A agents.

**Conclusions**

- Machine teaching can leverage knowledge for jointly increasing learner performance and teaching efficiency.
- Teaching efficiency can be increased by using machine learned model and existing knowledge.
- **Future Work**
  - Extending work to different tasks and domains.
  - MT for creating intelligent educational documents such as textbooks and open educational resources like Wikipedia.