# Generating Question-Answer Hierarchies

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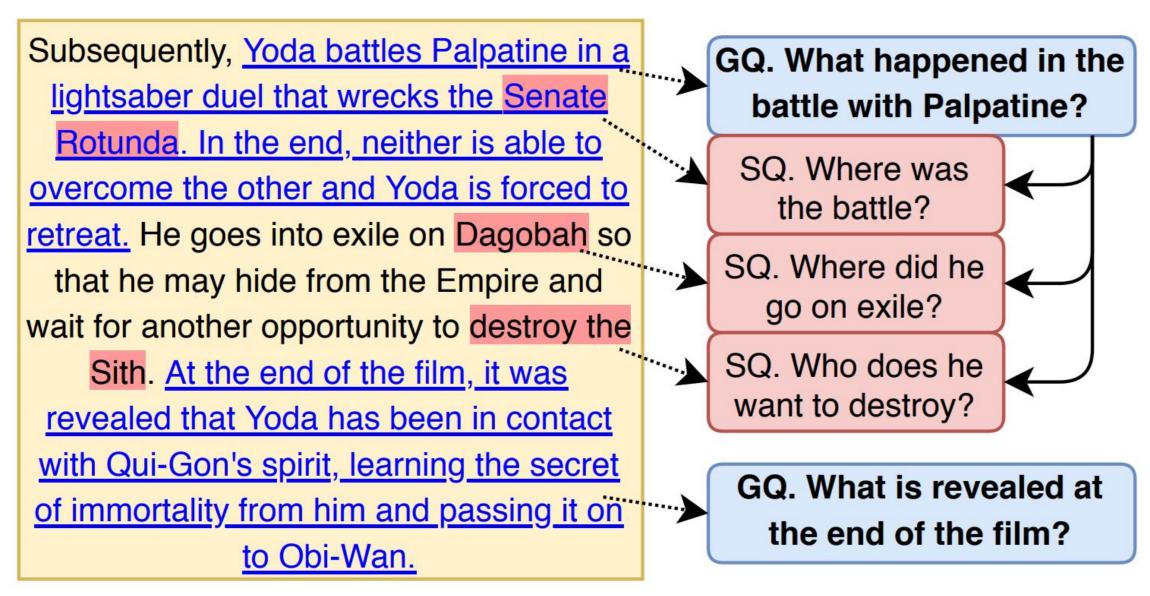
**UMassAmherst** 

code, dataset, demo at http://squash.cs.umass.edu

## Q1. What is this paper about?

A novel text generation task, Specificity-controlled Question Answer Hierarchies (SQUASH)

Input - sequence of paragraphs
Output - hierarchy of Question-Answer (QA) pairs
arranged according to their specificity



Q. What is the difference between blue and red QA? Top level (blue) - general, broad, overview questions Bottom level (red) - specific, drill-down questions

# Q2. How did we construct a dataset to train a SQUASH system?

- Collecting large-scale annotated data is expensive
- Instead, label questions in existing reading comprehension datasets (SQUAD, CoQA, QuAC) according to their specificity
- Q. What is the scheme for specificity labelling? Templates from Lehnert 1978 (48.5%), hand-labelling (0.5%), distant supervision (51%) crowdworkers agree

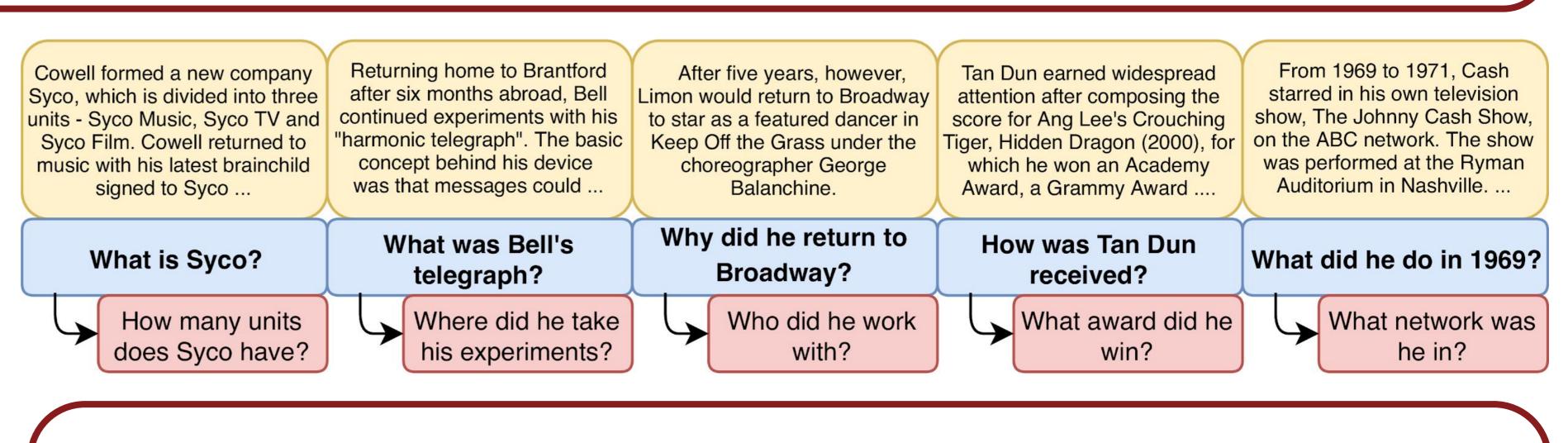
Lehnert 1978 category	Examples	Specificity
Causal Antecedent / Consequent, Enablement	Why, What happened after / before, What led to	general
Quantification	How many, How long	specific
Concept Completion / Feature Specification	What is computer science?, Who invented the computer?	general / specific

Q. What does the final dataset look like? A total of 277098 QA pairs (27.8% general, 54.2% specific, 18% yes/no questions)

## Q3. How do we SQUASH input paragraphs?

- 1. Train a specificity and answer conditioned neural question generation model
- 2. Generate general questions using full sentences and specific questions using entities and noun-phrases
- questions Question Question (Similar Span Document Selection Pipeline) Generation Answering Filtering Class , GENERAL J SPECIFIC J **Training Data SQUASH** RC Specificity Does Q match **Building QA Hierarchy** Output Classifier **Datasets** template?
- 3. Answer each generated question using QA system and filter bad questions (low answer overlap, unanswerable)
- 4. Construct hierarchy based on answer overlap and position of the predicted answers

#### William Bryan **Paul Weston** Weston was born Paul Wetstein in Springfield, ...The treaty granted the United States control of Massachusetts, to Paul Wetstein, a teacher, and Puerto Rico, Guam, Cuba, the Philippines, and Anna "Annie" Grady. The family moved to parts of the West Indies. Many of Bryan's Pittsfield when Weston was two, and he spent supporters were opposed to what they perceived his formative years in the town. His parents were as Republican aspirations of turning the country both interested in music, and when Paul Sr into an imperial power ... However, when the taught at a private girls' school, he was allowed Bacon Resolution (a proposed supplement to the to bring the school's gramophone ... Treaty of Paris which would allow the Filipinos a "stable and independent government") failed to Q. What are his parents like? pass, Bryan began publicly speaking out against A. Paul Wetstein, a teacher, and Anna the Republicans' imperial aspirations. "Annie" Grady. Q. Who was born in Springfield? Q. What was the treaty? A. Weston was born Paul Wetstein **A.** The treaty granted the United States in Springfield, Massachusetts, to control of Puerto Rico, Guam, Cuba, the Paul Wetstein, a teacher, and Philippines, and parts of the West Indies. Anna "Annie" Grady. Q. Where did the Treaty of Paris Q. Where was Weston born? come from? A. Springfield, Massachusetts, **A.** The treaty granted the United States control of Puerto Rico, Q. Who were his parents? Guam, Cuba, the Philippines, and A. Paul Wetstein, a teacher, and parts of the West Indies. Anna "Annie" Grady. Q. Where did he move to? Q. Why was this bad? A. The family moved to Pittsfield **A.** Many of Bryan's supporters were opposed to what they perceived as Q. How old was Weston when he Republican aspirations of turning the was born? country into an imperial power A. two Q. How did he get into music? Q. What was a result of the resolution? **A.** His parents were both interested in **A.** failed to pass, Bryan began publicly music, and when Paul Sr taught at a private speaking out against the Republicans' imperial aspirations. girls' school,



## Q4. How well does the proposed system work?

Primarily evaluated using crowdsourced studies on FigureEight

### Our system is good at producing

- well-formed questions (86%)
- questions relevant to the input paragraph (79%)
- questions obeying their specificity (90%)
- specific questions relevant to their parent general questions

Our system is bad at following coherent discourse structure, minimizing redundancy, generating insightful general questions

## Q5. Does SQUASH improve pedagogy?

Q. Where did he go to school?

→ A. Paul Sr taught at a private girls'

- Support for FAQs, hierarchies and QA mode of communication in HCl, CogSci, Socrates' teaching
- Needs user-studies with accurate SQUASH outputs

## Q6. What's new in our live demo?

An improved system with GPT-2 and BERT pre-training, coreference-resolved questions and customizable inference hyperparameters for generation and filtering