1 Task

Select one of the following topics (see Section 2), and (i) identify, (ii) analyze, and (iii) synthesize modern approaches for the topic you choose.

Identify For this assignment you will need to find an appropriate number of papers to discuss in detail. Though the final number that you select is highly dependent on, among other things, which topics you choose, the length of the papers, and their venues, a reasonable number of papers is between five and ten. This range does not constitute required minimums or maximums.

You may read many more papers than you discuss in detail. Do not view this as “wasted” effort—these should help inform the overall narrative and context for your discussion.

Analyze Ask and answer fundamental research questions: what were the goals of each of the papers? What scientific and engineering questions did each of the tackle? How well did the evaluations support the main claims? What was not done that could have been done?

Synthesize How do the efforts relate to one another? Do they follow one after another, making (incremental) progress on a task (metric)? Does one question some basic assumptions of another, and if so, how do the other papers fit in? What are the limitations of these approaches, and what still remains to be done? You can also link these papers and ideas to related fields.

2 Topics

Please select a topic from the three listed below. With consultation of the instructors, you may propose your own, separate topic.

2.1 Language Modeling and Distributed Representations

For this topic, you will examine language modeling, distributed (continuous) representations of language (e.g., word, sentence and document embeddings), and/or the application of either (or both) of these two areas. You may choose any subset of the topics.
Your paper may branch into other areas, as long as it includes a subset of the topics. E.g., problems formulated in the noisy-channel model (e.g., machine translation, speech recognition) or as reranking problems (e.g., parsing, machine translation) will use language models. Though language models typically model the surface form of (sequences of) words, researchers will also talk about “X” language models as a way to more explicitly (or better) incorporate “X” into the model formulation and learning. For instance, class-based language models partition words into different classes, or strata, in order to better differentiate aspects of word use, semantic language models are posited to better understand semantics or pragmatics, and entity language models incorporate entity coreference information as explicit features or aspects.

The topics for this paper often work in tandem. For instance, language modeling can give rise to new distributed representations, distributed representations can be used in classification tasks, and lexical features and language modeling scores can be useful parts of classification.

2.2 Grounded Language Processing

For this topic, you will examine how non-language signals (e.g., image or audio features) can help NLP tasks, how NLP tasks/models can improve understanding/analysis of those non-language signals, or both. For example, the task of (sequential) image captioning or video summarization involves producing natural language output that describes what is happening in those input images or videos. Visual question answering (and its variants) requires systems to answer questions about an image with a sunny sky in the background, answer the question “does it look like it’s going to rain?” Meanwhile, tasks involving conversational and dialogue agents (e.g., Google Now, or Alexa) may need to take in spoken language input and perform some action (including generating “spoken” language output) based on it.

2.3 Structured Prediction for NLP

For this topic, you will examine structured prediction for a single task, or a significant, relevant aspect of that task. Roughly, structured prediction is any task that given an input, produces some object or label with an internal structure. This is in contrast to prediction tasks that simply predict a single, “flat” label, without any decomposable or introspective structure. We’ve already covered in depth two instances of structured prediction—machine translation/alignment and part of speech tagging—and we’ll see more as we get further along in the semester. Canonical examples of structured prediction problems include, but are not limited to: (a) syntactic parsing (constituency or dependency); (b) machine translation; (c) semantic parsing (including FrameNet, PropBank, AMR, and VerbNet parsing); (d) structured information extraction (such as template-based slot filling as in the ACE Relation Extraction task); (e) ontology induction; (f) entity coreference or cross-document entity linking; and (g) summarization. Generally, “bags-of-items” models do not arise in structured prediction tasks. Tasks like question answering, recognizing/determining textual entailment, and sentiment analysis may or may not involve structured prediction. Your paper is not restricted to the preceding items; they are offered as suggestions.

3 Milestones

This paper has two milestones prior to the final submission. Both milestones must be met for full credit. Throughout the entire paper process, you may receive sanctioned UMBC writing assistance, such as through the GSA Writing Advisor. Your paper is not restricted to the preceding items; they are offered as suggestions.

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1 Although sentiment analysis often asks for a single label at the end, the internal classification may operate over structures. That is, the final flat label may be the result of some internal, latent structured prediction.

2 https://gsa.umbc.edu/writing-advisor/
Milestone 1: **Initial version of the paper**  This is due Wednesday, October 17th by 11:59 AM. Despite it being “initial,” this must be a complete, well-written paper. Although this draft will not solely comprise your grade, it should be a paper that you would find acceptable for determining your grade for the course’s paper component. To receive full credit, your paper must be a legitimate and full response to the prompt.

These initial papers should be submitted to the submission site, [https://www.csee.umbc.edu/courses/undergraduate/473/f18/submit](https://www.csee.umbc.edu/courses/undergraduate/473/f18/submit), selecting “Initial Graduate Paper.” You must turn in:

- an ANONYMIZED PDF of the paper,
- the paper’s source (such that we could regenerate the PDF).

Your anonymized PDF will be provided to other students to review (see Milestone 2); your source will not be shared.

You may also provide a written description of what, if any, writing assistance you received (e.g., the GSA Writing Advisor).

Milestone 2: **Paper Peer Review**  This is due Wednesday, November 14th by 11:59 AM. In this process, you will receive two other students’ papers; you must provide feedback on the breadth, depth, and clarity of exposition. Reviewing forms and guides will be provided. To receive full credit for the reviews, you must provide constructive and civil reviews (a guide will be provided).

This review will be “double-blind:” as a reviewer, you will not know whose papers you are reviewing, and as an author, you will not know who your reviewers are. This is why it is important for the Milestone 1 papers to be anonymized. All paper-reviewer identities will be known to course staff.

Final version of the paper  This is due Wednesday, December 5th by 11:59 AM. This must be a complete, well-written paper. These should be submitted to the submission site, [https://www.csee.umbc.edu/courses/undergraduate/473/f18/submit](https://www.csee.umbc.edu/courses/undergraduate/473/f18/submit), selecting “Revised Graduate Paper.” You must turn in:

- a NON-ANONYMIZED PDF of the paper,
- a PDF document discussing the changes made, both as a result of the reviews/feedback and along with any unprompted changes, and
- the paper’s source (such that we could regenerate the PDF).

As with the initial submission, you may also provide a written description of what, if any, writing assistance you received (e.g., the GSA Writing Advisor).

### 4 Requirements

Papers should be four pages, not including references, in the ACL format. Please use the ACL 2018 style guide; both \LaTeX{} and Microsoft Word (docx) versions are on GL:

/afs/umbc.edu/users/f/e/ferraro/pub/sty/acl18/acl18-latex.zip
/afs/umbc.edu/users/f/e/ferraro/pub/sty/acl18/acl18-word.zip

Be sure to cite appropriately and follow all academic honesty standards. You may include figures (your own, reproductions, or copies of existing figures); be sure to provide appropriate credit for the figures. However, make the figures count: do not include them simply to pad the paper. Do not consider just “recent” papers; try to find papers from the past 25 years.
Where to Start  You may analyze any papers read in class or as part of the assignments.

Google Scholar is an easy way to find linked and cited papers. Another great resource is the ACL Anthology (http://aclanthology.info/) archives papers by conferences (e.g., ACL, EACL, NAACL, NAACL), journals (CL, TACL), and workshops by year. It also offers multiple custom searches: for example, searching “distributed representations” returns papers for crosslingual word representations (C12-1089), representations for relational patterns (P16-1215), and representations for semantic role labeling (D15-1295).

The AAAI digital library also offers an extensive listing of AI-based conferences and proceedings. Of particular relevance are the flagship AAAI, ICML (International Conference on Machine Learning), and KDD (Knowledge Discovery and Data Mining) proceedings. Papers from NIPS (Neural Information Processing Systems) often tend to the more theoretical, but with a decided focus on neural networks.

This paper provides you immense leeway to relate current NLP methods to areas or topics you are interested in. Workshops often offer targeted application and interest areas. There are also special interest groups, which you can find on the main ACL Anthology page. For instance, are you interested in NLP for the humanities, Semitic languages, or biomedical applications?

You are welcome and encouraged to come talk with me, either during office hours, over email, or by appointment to discuss topics, advice on finding relevant papers, and the direction of your paper.

The following is a very small listing of potential starting papers:

7. Rosenfeld (2004): “Two Decades of Statistical Language Modeling: Where Do We Go From Here?”

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3 Paper ids generally have the form XYY-ZZZZ, where X is a single letter identifier (P is the main ACL, D is for EMNLP, Q is for TACL, etc.), YY are the final two digits of the year (2018 → 18), and ZZZZ is a per-proceedings identifier.