Post-Workshop Research Proposal

Off-Topic Detection:
Metaconversation and Small Talk

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Example

(Topic: Personal Habits)

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R: Uh, I'm in college so, like, my drinking is pretty cheap.
Maybe like five bucks a week.
L: Oh, that's not bad.
R: [LAUGH] Yeah, it's pretty cheap.
L: Mhm.
Wait, what college do you go to by the way?
R: University of Illinois.
L: Really, in Champagne?
R: Yeah. In Champagne.
L: Oh, wow.
R: And you live in New York?
L: Yeah.
R: Interesting.
L: Yeah.
But - um - So anyways I guess we're off topic again [LAUGH].
R: [LAUGH] Yeah
L: Um- [LAUGH] um, what were the other things on the list?
Oh yeah, overeating.
See, you know what I heard about, um, overeating is that - or - or just in general, like, you know, obesity and everything is that - um -
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But then pretty soon it's going at - um - switch over to obesity.
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Goal: Automatically classify sentences in recorded telephone speech

Motivations

- Just as "edit" regions can be removed to improve parsing, "small talk" regions could be removed to improve **information extraction**.
  (someone searching for weather information shouldn't get audio clips of "so, how's the weather?")

- Both metaconversation and small talk regions may help to identify changes in topic for **new topic detection**.
  - Meta: "Now we're supposed to talk about US public schools..."
  - Small talk: fills the gap between more-significant topics

Motivations

- Can also be applied to:
  - Meeting corpora
    ("You should have seen the traffic today...")
    ("Let's talk about the quarterly revenue report.")
  - Broadcast news
    ("I'm glad I'm safe inside the studio!")
    ("We now go live to Jim for an update.")
  - Surreptitiously recorded telephone conversations
    ("We had mac and cheese again tonight")
    ("So I was calling you because...")
  - Lectures, etc.

Related Work

- "Off-talk" detection for human-machine interaction
  (University of Munich)
  - "Oh, I have to click on that with the mouse"
- Social dialogue with conversational agents
  (Northwestern, MIT Media Lab)
  - Generating and responding to small talk with human users
- **NIST** Topic Detection and Tracking benchmark tasks (1998-2004)
  - Supervised and unsupervised classification techniques
  - Evaluation metrics

Proposal

- Weakly supervised classification of sentence units
- Local classification techniques:
  - Naive Bayes ("bag of words") classifier
  - Maximum-entropy (MaxEnt) classifier
  - Support Vector Machine (SVM) classifier
- Sequence decoding:
  - Hidden Markov Model (HMM)
  - Conditional Random Field (CRF)
- Train the classifier on a small set, use it to automatically "annotate" a much larger corpus, then iteratively re-train on the larger corpus

Feature Extraction

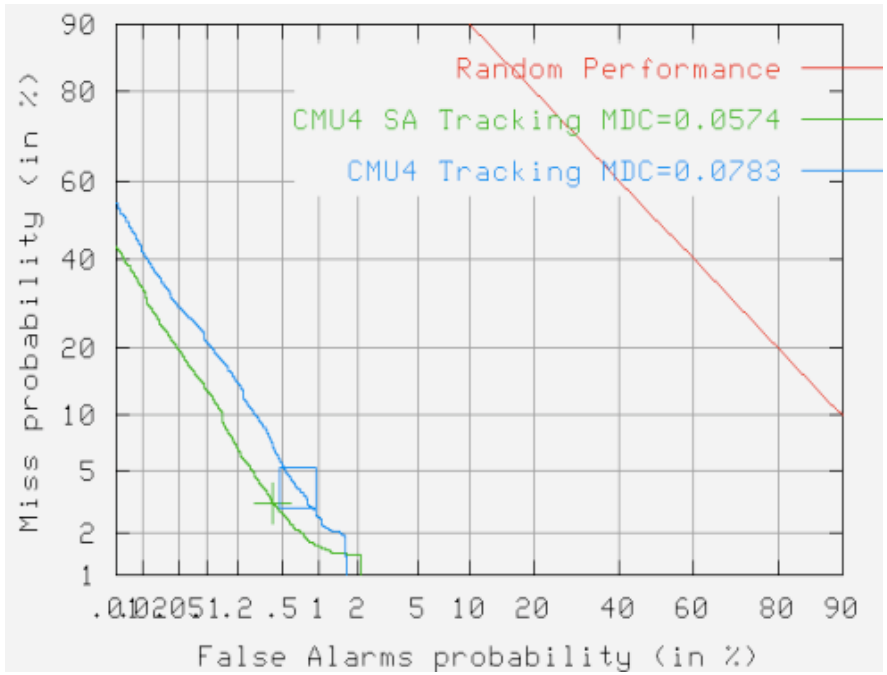
- Similar to our metadata reranking system
- Features which might prove useful:
  - Bigram or trigram language model
  - Key words such as filled pauses and discourse markers
  - Speaker changes and overlap
  - Duration of pauses
  - Frequency of awkward laughs
  - Etc.
- Easily extracted from our corpus

Annotation

- I've fully annotated 5 conversations, and looked over many others.
  - The time it takes to annotate is at *most* twice the length of the conversation.
  - We expect high annotator agreement.
- Weakly supervised learning techniques minimize the amount of annotation needed.
  - Need ~ 3 hours of training data (30 conversations) and another 3 hours for evaluation
  - 2 annotators for each conversation, plus a "tiebreaker"
  - ~ 30 hours of work = feasible
- Create annotation spec

Evaluation

- Accuracy - % of sentences correctly identified
- NIST metrics for Detection Evaluation
  - Detection Error Tradeoff curves
    - uses probability estimates to graph the tradeoff between misses and false alarms



We will find out:

- How well can off-topic regions be detected using standard machine learning techniques?
- How much training data is needed?
- Which machine learning algorithms work well?
- What features are effective?
- What is the effect of ASR and MDE errors?
- How well do ASR and MDE systems perform in on-topic vs. off-topic regions?

Conclusion

- **Useful**
  - Improve Information Extraction and New Topic Detection
- **Generalizable**
  - Meetings, Broadcast News, Phone Calls, ...
- **Feasible**
  - Builds on NIST TDT benchmark tasks
  - Small amount of annotation