0.0.1 Speech and Language Analysis

The aim within this area is to bring new and diverse methods to bear on the traditional problems of processing written and spoken language, as well as alternative, multimodal forms of input. It is intended to draw heavily on the foundational areas, such as "Inference" and "Data-Intensive Methods", and covers the range of methods from language technology, computational linguistics, and psycholinguistics more clearly than most other areas. A special feature of the EGK in this area is that it provides natural opportunities for cross-language research.

In Saarbrücken the area is represented by Barry's work on prosody in speech synthesis and automatic speech recognition, Pinkal's work on realistic semantic processing, Uszkoreit's work on robust deep grammatical processing with HPSG and also functional explanations modeling of grammar, and Wahlster's work on robust fusion of multimodal input. Crocker contributes experimental competence as well as substantial expertise in computational modeling, and corpus-based investigations.

In Edinburgh, Klein works on constraint-based approaches to prosody and the prosody-syntax interface and Taylor on speech recognition. Pickering's lab conducts psycholinguistic research into the kinds of mechanisms which influence incremental sentence interpretation. Steedman's research includes work on meaning of intonation and prosody, and also computational account of human incremental semantic processing. Lascarides does foundational work in discourse analysis, while Oberlander's project on discourse generation provides a more practical dimension which complements Crocker's project in human understanding of computer generated text.

Example Thesis Topic: Plausibility- versus Probability-based accounts of lexical association in human sentence processing.
Supervised by Crocker (Saarbrücken) and Pickering (Edinburgh).

Both computational and psycholinguistic models of sentence understanding rely on the likelihood of associations between words to resolve various kinds of ambiguities. The question is particularly relevant in determining whether people initially rely on simple, bottom-up, frequency estimate of likelihood (i.e. a probabilistic account), or whether they actually have immediate access to the full (top-down) semantic processing and inference mechanisms in determining plausibility. This thesis project will involve a number of on-line psycholinguistic experiments to explore this issue. The project will build on previous collaboration between Crocker and Pickering in developing probabilistic models of human sentence processing.

The two groups will take advantage of complementary psycholinguistic facilities: Edinburgh has a DPI eye-tracker, for high-resolution reading experiments, while the head-mounted (SMI) eye-tracker in Saarbrücken enables a more flexible range of studies based on visual-worlds with spoken-language stimuli, offering interesting new opportunities for research. Both sites have facilities for self-paced reading studies, and share access to an internet-based experimental system, which further facilitates cross-site collaboration.

Additional Thesis Topics

- Implicit vs. Explicit Prosody Modeling in ASR (Barry/Taylor)

- Incremental computation of interpretation preferences from partial meaning descriptions (Pinkal/Lascarides)

- Syntactic Analysis of Non-standard Constituents with Lexicalised Grammars (Uszkoreit/Steedman)

- Semantic unification in a multimodal interpretation lattice (Wahlster/Oberlander)

- Fluency in computer generated text: which kinds of aggregation process contribute to human readability? (Oberlander/Crocker)

- Modeling incremental semantic interpretation and its interaction with parsing for verb final languages under the strict competence hypothesis (Steedman/Crocker)

- A Dynamic Semantic Account of Imperatives in Discourse (Lascarides/ Kohlhase)