BSc(Hons) in Human Language Technology Final-year Project Topics

The following is a list of topics you can choose for your final year project. Each of them has one or two supervisors. You can click on a title to read a summary of the proposed research project.

If you are interested in one or more of these topics, please contact the relevant supervisor(s) to discuss it further.

- Grammar Practice for Language Learners learning Maltese - *Dr Claudia Borg*

- Speaker Change Detection in Conversational Speech - *Dr Andrea De Marco*

- Modelling morpho-syntax - *Prof. Ray Fabri*

- Prediction of turn changes - *Prof. Patrizia Paggio*

- Modelling Emoji use by Maltese speakers - *Prof. Patrizia Paggio*

- Development and evaluation of a tool for the automatic transcription of Maltese intonation - *Prof. Alexandra Vella*

Grammar Practice for Language Learners learning Maltese

Dr Claudia Borg

The idea behind this thesis is to develop a web-based tool that would allow people learning Maltese to practice grammatical aspects of the language. There are a number of challenges that we can look into 1) how to produce different exercises aimed towards different learner categories (L1, L2 and adults); 2) analysing how the learner progresses to suggest followup exercises. The proposal is flexible enough to allow the student to decide which should be the focal point of the thesis - (1) focusing on the linguistic side and studying which morphological features are learnt at which level, and creating the exercises to mirror these levels OR (2) AI perspective in terms of selecting the next exercise in an intelligent way. In either case, a computational element of this project is a must. The project will make use of existing models for Maltese.

Speaker Change Detection in Conversational Speech

Dr Andrea De Marco

Speaker change detection is the process by which the moments in a conversation or dialogue where there is a change in speaker are tracked and marked. This allows speech understanding systems following a dialogue to know "who spoke when" - an important pre-processing step for dialogue understanding via speech interfaces. The aim of this study is to employ modern machine learning algorithms trained on acoustic features to be able to discern distinct human voices (speaker identification), and track them along a conversation (speaker change detection).

Project Outline:
1. Build a pre-trained CNN for speaker classification
2. Obtain speaker-distinctive embeddings from final layers of CNN
3. Track change of embeddings along a conversation for speaker change detection

Prerequisites:
- Sound knowledge of machine learning and neural networks
- LIN3503 - Speech Technology

Reference Paper:
M. Hrúz and Z. Zajíc, "Convolutional Neural Network for speaker change detection in telephone speaker diarization system," 2017 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), New Orleans, LA, 2017, pp. 4945-4949.

Modelling morpho-syntax

Prof. Ray Fabri

Optimality Theory (OT) and Lexical Functional Grammar (LFG) are two of the most successful models of grammar that have been adopted to account for various grammatical phenomena in different languages. However, there have been only very few applications of these theories to

Maltese data in order to explore specific syntactic phenomena, such as word order, case assignment, grammatical agreement, and morphological phenomena, such as inflectional paradigms, derivational relations, and word formation process (e.g. affixation, reduplication, ablaut). Students are encouraged to choose a theoretical framework and a specific area of grammar for analysis, to then collect the relevant data and analyse it within the chosen framework and in the context of similar studies in other languages. The study can also include a mini-implementation for HLT students who are interested in applications that involve some degree of language processing.

Prediction of turn changes

Prof. Patrizia Paggio

Turn management is the process by which conversation participants regulate the interaction flow. We know that this is done by both verbal and non-verbal cues, such as eye-gaze or head movements. The aim of this study is to investigate, by means of machine learning algorithms, to what extent turn changes in a conversation can be predicted based on linguistic, acoustic and gestural features such as length of utterance, pitch, pauses, head movements, etc. Students wanting to work with Maltese multimodal data can use the MAMCO corpus made available by the iLLT.

Programming steps required:
- extracting linguistic and gesture features from annotations in XML format,
- extracting acoustic features from sound files (possibly using the Praat tool),
- training and testing machine learning algorithms for the prediction of turn change.

Reference paper:
Duncan S. D. (1972). Some signals and rules for taking speaking turns in conversation. J. Pers. Soc. Psychol. 23 283–292. 10.1037/h0033031.

Modelling Emoji use by Maltese speakers

Prof. Patrizia Paggio

Emojis have become extremely popular in text messaging and social media, where they are used not only as paralinguistic features to add emotional content, but also to emphasise or further refine word content and even as word substitutes. This project will investigate emoji use by Maltese speakers by collecting relevant online data and applying NLP techniques (e.g. distributional semantic models) to study their use and the way they contribute meaning to text.

Programming steps required:
- collecting relevant online data (e.g. from twitter),
- applying vectorial models (e.g. skip-gram neural embedding models) to emojis
- possibly using visualisation techniques (e.g. t-SNE projectins) to study the results of the vectorial representations

Reference paper:

Francesco Barbieri, Francesco Ronzano, and Horacio Saggion. 2016. What does this emoji mean? A vector space skip-gram model for twitter emojis. In Language Resources and Evaluation conference, LREC, pages 526–534, Portoroz, Slovenia, May.

Development and evaluation of a tool for the automatic transcription of Maltese intonation

Prof. Alexandra Vella

Whilst a number of intonational categories have been identified for Maltese (e.g. nuclear and post-nuclear tunes for statements and questions and a distinct wh-question tune), many aspects of the intonation of Maltese constitute as yet unchartered waters. For example, a tune signalling politeness has been identified but not fully described, and exclamations, imperatives and vocatives seem to use a tune similar to that which occurs in wh-questions and which includes a high tone linked further left than the more usual anchoring point of the stressed syllable, etc.

This project aims to:
1. Establish a set of labels to be used in annotating the intonation of Maltese data using available descriptions of the intonation of Maltese as a starting point.
2. To decide on at least two different methods of prosodic annotation which could be used (e.g. a Rapid Prosodic Transcription method vs. a ToBI-style transcription method).
3. To carry out or obtain manual annotations of select data sets using the different transcription methods.
4. To develop a tool for automating the annotation using the different transcription methods and to test this system on different data sets.
5. To evaluate the automatic annotation tool developed.

A (preliminary) automatic prosodic annotation tool for Maltese annotation would be valuable in itself. More importantly, availability of such a tool would also allow for data to be prosodically annotated more quickly, thus allowing researchers to formulate and test hypotheses related to intonation and meaning in Maltese, which would in turn feed into a more complete description of this aspect of the grammar of the language.