

# Deep learning for chatbots

- [IXA group](#), [Google award](#), [CHISTERA project](#)

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## Description

Chatbots, dialogue systems and conversational agents have been gaining attention very fast in the past few years (e.g. Amazon Echo, Google Home, Microsoft Cortana, Apple HomePod, ...). The aim of this software agents is to converse with humans as coherently and engagingly as possible. However, building such open-domain conversational agents remains a major unsolved challenge in natural language processing. Their conversational and understanding ability is very limited and brittle, partly due to the need of writing manual rules which govern the behaviour of the system.

In this project the student will apply deep learning to develop chatbots that are able to learn after deployment, that is, the chatbots will be trained on simulated dialogues and then deployed with real users for further training. The key idea for this lifelong learning capability is to get feedback from the users, in order to improve the parameters of the system, possibly using reinforcement learning. The project will use publicly available datasets, in order to compare against other state-of-the-art systems.

The student will learn how to build a multilingual Question-Answering chatbot based on deep learning

This project is defined in the context of a [Google award](#) received by Eneko Agirre, and the 3-year CHISTERA project <http://www.chistera.eu/projects/lihlith> involving four universities and a company (Switzerland, France, France) lead by Eneko Agirre.

## Goals

The student will apply deep learning in order to build an open conversational agent which is able to learn at deployment time, beyond the training phase. The key objectives are the following:

1. Analysis of the state of the art techniques for developing conversational AI agents using lifelong learning
2. Design of an AI agent that is able to learn after deployment
3. Implementation and evaluation of the model

## Requirements

English. Machine learning. Good programming skills, basic math skills.

Although it is not a requirement, taking the course “**Seminar on language technologies. Deep Learning**” (see below) will allow the student to accomplish more ambitious goals. Contact us for further details.

The dissertation can be written in Basque, English or Spanish.

## Framework

Python, pytorch, parIAI (Miller et al. 2017).

## Tasks and plan (can start anytime, months below approximate)

Dec-January: Study literature, select tasks, install and run ParlAI agents

February: Attend course “Seminar on language technologies. Deep Learning”, familiarise with Pytorch (see below)

Mar-May: Development and experiments

June: Write down and presentation

## References

- Adams, T. (2017). AI-Powered Social Bots. *arXiv:1706.05143*. Retrieved from <http://arxiv.org/abs/1706.05143>
- Krause, B., Damonte, M., Dobre, M., Duma, D., Fainberg, J., Fancellu, F., ... Webber, B. (2017). Edina: Building an Open Domain Socialbot with Self-dialogues. *arXiv:1709.09816*. Retrieved from <http://arxiv.org/abs/1709.09816>
- Miller, A.H., Feng, W., Fisch, A., Lu, J., Batra, D., Bordes, A., Parikh, D. and Weston, J., 2017. ParlAI: A Dialog Research Software Platform. *arXiv preprint arXiv:1705.06476*. Retrieved from <http://arxiv.org/abs/1705.06476>
- Serban, I. V., Sankar, C., Germain, M., Zhang, S., Lin, Z., Subramanian, S., ... Bengio, Y. (2017). A Deep Reinforcement Learning Chatbot. *arXiv:1709.02349*. Retrieved from <http://arxiv.org/abs/1709.02349>

## Seminar on Language Technologies. Deep learning. (LAP18)

Deep Learning neural network models have been successfully applied to natural language processing. These models are able to infer a continuous representation for words and sentences, instead of using hand-engineered features as in other machine learning approaches. The seminar will introduce the main deep learning models used in natural language processing, allowing the students to gain hands-on understanding and implementation of them in Tensorflow .

### Topics

- Introduction to machine learning and NLP with Tensorflow

- Deep learning

- Word embeddings

- Language modeling and recurrent neural networks

- Convolutional neural networks

- Attention mechanisms

Prerequisite. Basic programming experience, a university-level course in computer science and experience in Python. Basic math skills (algebra or pre-calculus) are also needed.