



MASTER OF SCIENCE  
IN ENGINEERING

Master of Science HES-SO in Engineering  
Av. de Provence 6  
CH-1007 Lausanne

**Hes·SO**

Haute Ecole Spécialisée  
de Suisse occidentale

Fachhochschule Westschweiz

University of Applied Sciences and Arts  
Western Switzerland

# Master of Science HES-SO in Engineering

## Orientation: Information and Communication Technologies (ICT)

# GenBot

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Lausanne, HES-SO//Master, March 25, 2019

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## **Dedicate**

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# Acknowledgments

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# Glossary

## **AdaGrad**

Adaptive Gradient Algorithm that maintains a per-parameter learning rate that improves performance on problems with sparse gradients (e.g. natural language and computer vision problems)..



# Acronyms

## **<sup>13</sup>C**

carbon-13.

## **ACN**

Acetonitrile.

## **CHCA**

Cyano 4 hydroxy cinnamic acid.



# Abstract

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**Key words:** Data Engineering, Machine Learning, Data Services, Conversational Agents conversational, chatbot, Natural Language Understanding (NLU), generic



# Chapter 1

## Introduction

**Today** Beginning of 2019, Chatbots are everywhere but very limited to narrow tasks, and are, in most cases, sequences of if-else conditions resulting in a very weak AI. Indeed, hard-coded connections are requiring an infinite amount of human power to create generic Chatbots able to maintain a conversation at a human level. However, the progress in the field of machine learning is demonstrating that providing large corpora to an unsupervised algorithm is enough to maintain a passive conversation with users, which results into a shifting of the human power into data engineering. Multiple algorithms and technics are emerging monthly, which are demonstrating promising conversational performance improvement; however, they are all still narrow AIs. Indeed, even if they are getting better at providing meaningful sentences, they are still not able to generalize all tasks linked to a conversation, such as, understanding the context, search and learn for missing information, initiate conversation in a meaningful manner, be intuitive, and more. The generalization of those features would allow a significant step forward into general Chatbots. Humbly, the goal of this deepening semester project is to suggest and demonstrate approaches as a premise to Artificial General Intelligence and getting a step closer to general Chatbots, which can initiate and maintain human-like conversations in a pro-active manner.

**Driver** iCoSys, the Institut of Complex Systems at University of Applied Sciences and Arts at Fribourg, Switzerland, is interested into the result of this project as a study for their AI-News project, whose goal is to provide a chatbot as a tool to reader, to help them narrow their interests and deliver the right information. AI-News is in collaboration with Swiss Innovation Agency from the Swiss Confederation, and La Liberté, the daily newspaper from Fribourg.

### 1.1 Aim of Study

### 1.2 Scope and Limitation of Study





# Chapter 2

## Questions

### 2.1 Initial Broad Questions

- Is the artificial neural network approach appropriate to represent the world?
- Can agents be made exclusively from a language?
- Can agents be able to experience an environment?
- Is a narrative environment enough to understand an environment?
- Is the language able to provide to an agent an understanding of the world?
- Is the knowledge of the language syntax enough to gain an understanding?
- Is the result of unsupervised learning enough to discover all nuances?
- Is the unsupervised learning sufficient to make sense of an environment?
- Is a descriptive explanation of the world expressible in a language?
- Is the description good enough to catch all the nuances?
- Is the language good enough to explain?
- Can we augment or make a semantic language?
- Can we create a common symbolic language?
- Is the language multi-dimensional?
- How many dimensions are needed for a complex language?
- Is it possible to give a word equivalence to machines for human-specific words?
- Are all emotions describable in words?
- Are emotions altering language descriptions?
- Is an approximation of the real world enough to understand the environment?
- Would a simulated world be a good approximation of the real world?

### 2.2 Narrowed Questions

- Common human-machine language
  - Is it possible to create a multi-dimensional human-machine language, which includes a common semantic, symbolic, and emotion definition.
  - Is it possible to create an abstract world for machines to understand human symbolic based on a real world, and define fundamentals for machine representation of the language.
- Machine intuition

## **Chapter 2. Questions**

- Is it possible to provide to machines an human-like intuition (inside voice), which would help to keep a long term context and specialize in specific fields.
- Evaluate human-machine communication
  - Is it possible to provide a protocol to test the communication skills and machine understanding.

### **2.3 Deepening Project Questions**

- How to verify and quantify a chatbot understanding?
- What is the premise to make chatbots general with today's technology?
- How chatbot can be proactive?
- How to simulate human-like intuition in chatbots?

# Chapter 3

## Plan

### 3.1 Initial Plan

**Timeframe:** 15 weeks

**Starting date:** 18.02.2019

**Ending date:** 31.05.2019

**18.02.19 to 08.03.19** (3 weeks)

- Do the initial research about general chatbots
- Determine the project target
- Play with the subject
- **DELIVERABLE:** Plan and Initial Specification document

**11.02.19 to 29.03.19** (3 weeks)

- Explore the Word2Vec methodology and its extensions
- Combine and test ANN algorithms with Word2Vec
- **MVP:** Basic multi-dimensional word embedding space

**01.04.19 to 19.03.19** (3 weeks)

- Explore ANN algorithm topology for the chatbot
- Analysis of the chatbot intuition with parallel algorithms
- Analysis of a protocol to evaluate proactive chatbots
- **MVP:** Basic conversational agent

**22.04.19 to 10.05.19** (3 weeks)

- Profile-based initiatives
- Analysis and experiment of the profile nurturing
- Analyze and experiment with chatbot initiatives with no profiles.
- **MVP:** Basic proactive chatbot

## Chapter 3. Plan

**13.05.19 to 31.05.19** (3 weeks)

- Overall improvements
- Autonomous data gathering
- Make suggestions
- Determine possible continuation and future outcomes for the project
- **DELIVERABLE:** Report + Sources

## Chapter 4

# Literature Review and Research Proposal

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### 4.1 State of the art

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#### 4.1.1 Patent law

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## **Chapter 4. Literature Review and Research Proposal**

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# Chapter 5

## Results

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### 5.1 Materials

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### 5.2 Products

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## Chapter 5. Results

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## Chapter 6

# Discussion

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## Chapter 7

# Experimental Part

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## Chapter 8

# Conclusion

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AdaGrad Acetonitrile (ACN) 13C Cyano 4 hydroxy cinnamic acid (CHCA)

Lausanne, March 25, 2019

Romain Claret



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# Appendix

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## .0.1 Appendix

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