

# Michele Cafagna

PH. D - MARIE SKŁODOWSKA-CURIE, MACHINE LEARNING RESEARCHER & ENGINEER

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## Education

### Institute of Linguistics and Language Technology, University of Malta

*Msida, Malta*

PH. D. - MARIE SKŁODOWSKA-CURIE FELLOW

*Sep. 2020 - Present*

- Research in Multimodal AI (Computer Vision and Natural Language Processing) and Explainable AI (XAI).

### Università di Pisa

*Pisa, Italy*

MSC. IN COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE, 110/110

*2017 - 2019*

- Master Thesis on Headline Generation and Analysis of Writing Styles in Journalism (Natural Language Generation).

### Università degli Studi di Bari

*Bari, Italy*

B.S. IN COMPUTER SCIENCE AND SOFTWARE PRODUCTION TECHNOLOGIES, FULL MARKS

*2014 - 2017*

- Bachelor Thesis titled Software system based on pattern recognition to features extraction of leukocyte cells

## Skills

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| <b>Professional</b> | Natural Language Processing, Natural Language Generation, Natural Language Understanding, Computer Vision, Multimodality, XAI, Research, Machine Learning, Software Engineering, Data Analysis, Evaluation, Data Collection, Test Driven Development, Microservices, OpenAPI, Agile. |
| <b>Programming</b>  | Python, C/C++, Bash, JAVA, Matlab, Javascript  |
| <b>Software</b>     | Pytorch, Wandb, Docker, Git, Linux, Flask with Python, LaTeX   |
| <b>Languages</b>    | English (professional proficiency), Italian (native), French and Spanish (intermediate proficiency)  |

## Experience

### Orange Innovation Labs

*Lannion, France*

RESEARCH INTERN

*Oct. 2022 - December 2022*

- Multimodal XAI for industrial application
- Developed a model-agnostic XAI technique to explain Vision-to-Text Models, based on visual and textual semantics

### University of Utrecht

*Utrecht, The Netherlands*

VISITING RESEARCHER

*Jan. 2022 - Aug 2022*

- Worked on explainable AI techniques applied to V&L models
- Performed an in-depth analysis on the impact of the exposure to high-level linguistic concepts to Vision and Language generative models
- Supervision of a Master student in AI.

### Aptus.AI

*Pisa, Italy*

MACHINE LEARNING RESEARCH SCIENTIST & SOFTWARE ENGINEER

*Jul. 2019 - Sep. 2020*

- Research, development and deployment of Deep learning Multimodal models
- Implement and design microservices architectures for AI-based applications
- Work closely to other team members to plan, design, and develop robust solutions, in an Agile workflow

### Research Center For Language and Cognition (CLCG), University of Groningen

*Groningen, The Netherlands*

VISITING RESEARCHER

*Apr. 2019 - Jul. 2019*

- Worked on Generative Language Models and Analysis of Writing Styles in Journalism under the supervision of Prof. Malvina Nissim
- Collected and analysed hundreds of thousands of news scraped from Italian newspapers
- Experimented with various generative models for headline generation task, assessed by means of human evaluation
- Developed an automatic methodology based on classification, to evaluate the stylistic features learned by a generative language model
- Devised a method to evaluate the styles of two corpora observing word shifts in the embedding space

## Selected Publications

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### Interpreting Vision and Language Generative Models with Semantic Visual Priors

MICHELE CAFAGNA, LINA MARIA ROJAS BARAHONA, KEES VAN DEEMTER, ALBERT GATT

*Frontiers in AI Journal*

2023

### HL Dataset: Visually-grounded Description of Scenes, Actions and Rationales

MICHELE CAFAGNA, KEES VAN DEEMTER, ALBERT GATT

*INLG, Prague, Czech Republic*

2023

### Understanding Cross-modal Interactions in V&L Models that Generate Scene Descriptions

MICHELE CAFAGNA, KEES VAN DEEMTER, ALBERT GATT

*UM-IoS Workshop, EMNLP 2022, Abu Dhabi, United Arab Emirates*

2022

### VALSE: A Task-Independent Benchmark for Vision and Language Models Centered on Linguistic Phenomena

LETITIA PARCALABESCU, MICHELE CAFAGNA, LILITTA MURADJAN, ANETTE FRANK, IACER CALIXTO AND ALBERT GATT

*ACL 2022, Dublin, Ireland*

2022

### What Vision-Language Models ‘See’ when they See Scenes

MICHELE CAFAGNA, KEES VAN DEEMTER AND ALBERT GATT

*pre-print, in submission*

2021

### VILMA: A Zero-Shot Benchmark for Linguistic and Temporal Grounding in Video-Language Models

ILKER KESEN, ANDREA PEDROTTI, MUSTAFA DOGAN, MICHELE CAFAGNA, EMRE CAN ACIKGOZ, LETITIA PARCALABESCU, IACER CALIXTO, ANETTE FRANK, ALBERT GATT, AYKUT ERDEM, ERKUT ERDEM

*submitted to ICLR2024*

2023

### TextFocus: Assessing the Faithfulness of Feature Attribution Methods in NLP

ETTORE MARIOTTI, MICHELE CAFAGNA, ANNA ARIAS DUART, ALBERT GATT

*submitted to TACL*

2023

### GePpeTto Carves Italian into a Language Model

LORENZO DE MATTEI, MICHELE CAFAGNA, FELICE DELL’ORLETTA, MALVINA NISSIM, MARCO GUERINI

*CLiC-it, Bologna, Italy*

2020

## Honors & Awards

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|------|---|---------------------------|
| 2023 | <b>Outstanding reviewer</b> , The 17th Conference of the European Chapter of the Association for Computational Linguistics (EACL2023)               | <i>Dubrovnik, Croatia</i> |
| 2019 | <b>Best Paper Award Finalist with Special Mention</b> , Clic-it 2019 Sixth Italian Conference on Computational Linguistics                          | <i>Bari, Italy</i>        |
| 2017 | <b>Finalist</b> , e-Health Award. Research Competition or project on Digital Health, AiSDet Associazione Italiana di Sanità Digitale e Telemedicina | <i>Bari, Italy</i>        |

## Projects

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### NL4XAI - Natural Language For Explainable Artificial Intelligence

*University of Malta, Malta*

EARLY STAGE RESEARCHER

*August. 2019 - Present*

- NL4XAI is an advanced training programme. The project selected 11 creative, entrepreneurial and innovative early-stage researchers (ESRs), who will face the challenge of making AI self-explanatory and thus contributing to translate knowledge into products and services for economic and social benefit, with the support of Explainable AI (XAI) systems. Project consortium consists of 10 beneficiaries and 8 partner organization and it is funded by the Horizon 2020 research and innovation programme, through a Marie Skłodowska-Curie grant, in the framework of the European Union's bet for Explainable Artificial Intelligence
- My main challenge is to study deep multimodal architectures for generating language from visual data, looking 'under the hood' for evidence that the choices made by a generator are indeed grounded in the input, that is, motivated by (and explainable on the basis of) the sensory information.

### Patent - Training procedure and system for artificial intelligence intended for the analysis of mammographic data for the identification or exclusion of the presence of breast cancer

*US Patent 17/582,180, 2022*

INVENTOR

*2022/7/28*

- Training procedure for artificial intelligence for mammographic data analysis for breast cancer detection including acquiring mammographic data from a plurality of sources and including mammographic images, report texts relating to images, and structured data obtained from SIO, EMR, BI-RADS and MOM including at least metadata relating to part of the images, processing the mammographic data through algorithms implementing a multimodal deep neural network (DNN) developing a mammographic data analysis model by performing learning based on sub-phases of first multi-label classification of each image implemented through a model with Encoder-Decoder architecture based on convolutional neural network (CNN) and/or Transformers, association of parts of report texts with images and/or parts of structured data, implemented through a model with Encoder-Decoder architecture based on a bidirectional long-term memory (Bi-LSTM) and/or Transformers, second multi-label classification of mammographic structured data implemented through a model with Encoder-Decoder architecture based on CNN and/or Transformers.

## Selected Presentations

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### 16th International Natural Language Generation Conference (INLG2 2023)

*Prague, Czech Republic*

POSTER PRESENTER

*Sep. 2023*

- HL Dataset: Visually-grounded Description of Scenes, Actions and Rationales

### The 2022 Conference on Empirical Methods in Natural Language Processing (EMNLP 2022)

*Abu Dhabi, United Arab Emirates*

POSTER PRESENTER

*Dec. 2022*

- Understanding Cross-modal Interactions in V&L Models that Generate Scene Descriptions

### 60th Annual Meeting of the Association for Computational Linguistics (ACL 2022)

*Dublin, Ireland*

ORAL AND POSTER PRESENTATION

*May. 2022*

- VALSE: A Task-Independent Benchmark for Vision and Language Models Centered on Linguistics Phenomena

### Advanced Language Processing Winter School (ALPS 2022)

*Grenoble, France (online)*

POSTER PRESENTATION

*Jun. 2022*

- Presented "Multimodal Grounding and Semantic Transparency for Generative VL models"

### 26th International Conference on Applications of Natural Language to Information Systems (NLDB-2021)

*DFKI Saarbrücken, Germany*

ORAL PRESENTER

*Jun. 2020*

- The panel was dedicated to Natural Language Technologies for Explainable AI. My presentation was focused on our work on analysing pretrained Vision-Language models capabilities to link high level concepts present in scenes to low-level information.

## **EVALITA2020 Seventh Evaluation Campaign of NLP and SPEech Tools for Italian**

*online*

ORAL PRESENTER

*Nov. 2020*

- "Change Headline, Adapt News, GEnerate Shared Task", CHANGE-IT!@EVALITA2020. Lorenzo De Mattei, Michele Cafagna, Malvina Nissim, Felice Dell'Orletta, Albert Gatt.

## **Clic-it 2019 Sixth Italian Conference on Computational Linguistics**

*Bari, Italy*

ORAL PRESENTER

*Nov. 2019*

- Embeddings shifts as proxies for different word use in Italian newspapers. Michele Cafagna, Lorenzo De Mattei, Malvina Nissim.

## **Reviewing Activity**

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|-----------|---|-------------------------------|
| 2023      | <b>EMNLP 2023</b> , The 2023 Conference on Empirical Methods in Natural Language Processing           | <i>Singapore</i>              |
| 2023      | <b>ECAI 2023</b> , 26th European Conference on Artificial Intelligence                                | <i>Kraków, Poland</i>         |
| 2023      | <b>INLG 2023</b> , 16th International Natural Language Generation Conference                          | <i>Prague, Czech Republic</i> |
| 2023      | <b>ACL 2023</b> , 61th Annual Meeting of the Association for Computational Linguistics                | <i>Toronto, Canada</i>        |
| 2022      | <b>EACL 2023</b> , European Chapter of the ACL  | <i>Dubrovnik, Croatia</i>     |
| 2022-2023 | <b>Computer Speech &amp; Language Journal</b> , International Speech Communication Association (ISCA) |                               |
| 2022      | <b>COLING 2022</b> , The 29th International Conference on Computational Linguistics                   | <i>Gyeongju, South Korea</i>  |
| 2021      | <b>INLG 2021</b> , 14th International Conference on Natural Language Generation                       | <i>Aberdeen, UK (Online)</i>  |