SCIENCES & BIOENGINEERING SCIENCES

The Research Group
Artificial Intelligence Lab

has the honor to invite you to the public defence of the PhD thesis of

Peter Dekker

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:

Identifying drivers of language change using agent-based models

Promotor:
Prof. dr. Bart de Boer

The defence will take place on

Friday, September 6 2024 at 5 p.m. in auditorium I.2.02

Members of the jury

Prof. dr. Geraint Wiggins (VUB, chair)
Prof. dr. Elisa Gonzalez Boix (VUB, secretary)
Prof. dr. Rik Vosters (VUB)
Prof. dr. Erich Round (University of Surrey, UK)
dr. Stella Frank (University of Copenhagen, Denmark)

Curriculum vitae

Peter Dekker obtained a BSc and MSc degree in Artificial Intelligence at the universities of Utrecht and Amsterdam in The Netherlands. Central in his work is the use of computational methods to better understand human communication and language change. After his studies, he developed software for language resources (e.g. dictionaries) at the Dutch Language Institute. In his PhD at the AI Lab of the VUB, he studies language change using agent-based simulations. He published articles for academic and general audiences and supervised bachelor's and master's theses.

Abstract of the PhD research

In this thesis, I study how languages change in situations where languages or groups of speakers are in contact with each other. As language change is inherently caused by interaction between individuals, I use a technique from multi-agent AI that puts the interaction of individuals central: agent-based computer simulations. I apply these agent-based models to specific case studies of language change in the real world. The goal of the thesis is two-fold: getting a better view on the mechanisms of language change and studying how computational methods work on real-world problems with small amounts of data. I present three different computer models, which each answer a particular linguistic question given a specific case study or dataset.

In my first model, I study how language contact can make languages simplify, using a case study of Alorese, a language in Eastern Indonesia. By integrating data from the language into an agent-based model, I study if the phonotactics of the language, the allowed structure of sounds following each other, could play a role in simplification. In my second model, I investigate if mechanisms in conversations could be a factor in language change. Using an agent-based model, I show how speakers influencing each other's linguistic choices in conversations can under certain circumstances, lead to spread of an innovative form. In my third model, I investigate what could be a cognitively realistic computer model for the 'brain' of the speakers, that could be used in an agent-based simulation. I developed a neural network model, based on a technique called Adaptive Resonance Theory, that has as its task to cluster verbs that conjugate in the same way into groups. The model is able to learn the systems of verbs of languages from different families, while being interpretable: it is possible to visualise to which parts of the words the network attends.

Together, the three models show how different mechanisms that interact with each other can lead to language change, when languages are in contact. The models show how mechanisms working on short timescales, such as on the scale of a conversation, can cause effects on the longer term, leading to language change. At the same time, this thesis gives insights for the development of communication in multi-agent AI systems, especially when there are multiple types of agents, as is the case in language contact situations.