

# Pioneering the research in Social Robots (2007-2026)

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- Founder and past chair of the Institute for Media Innovation, NTU, Singapore (2009-2021)
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- <https://nadineforgood.ch/>



# Research on social robots (2007-ongoing)

## My Social robot companions



Eva conversational robot  
(2007-2013) UNIGE  
(Sofia origin)

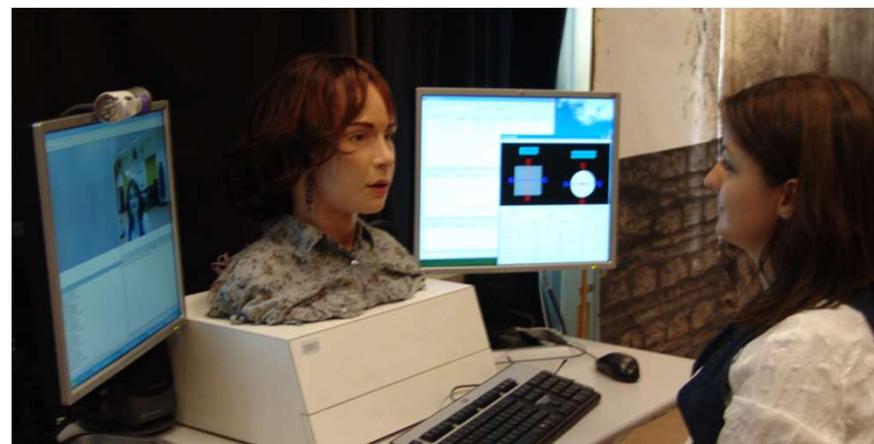
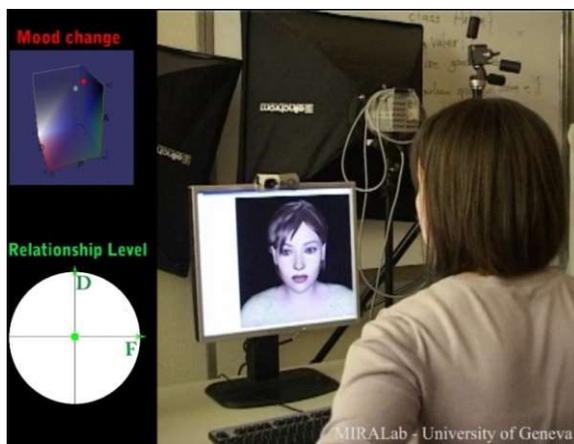
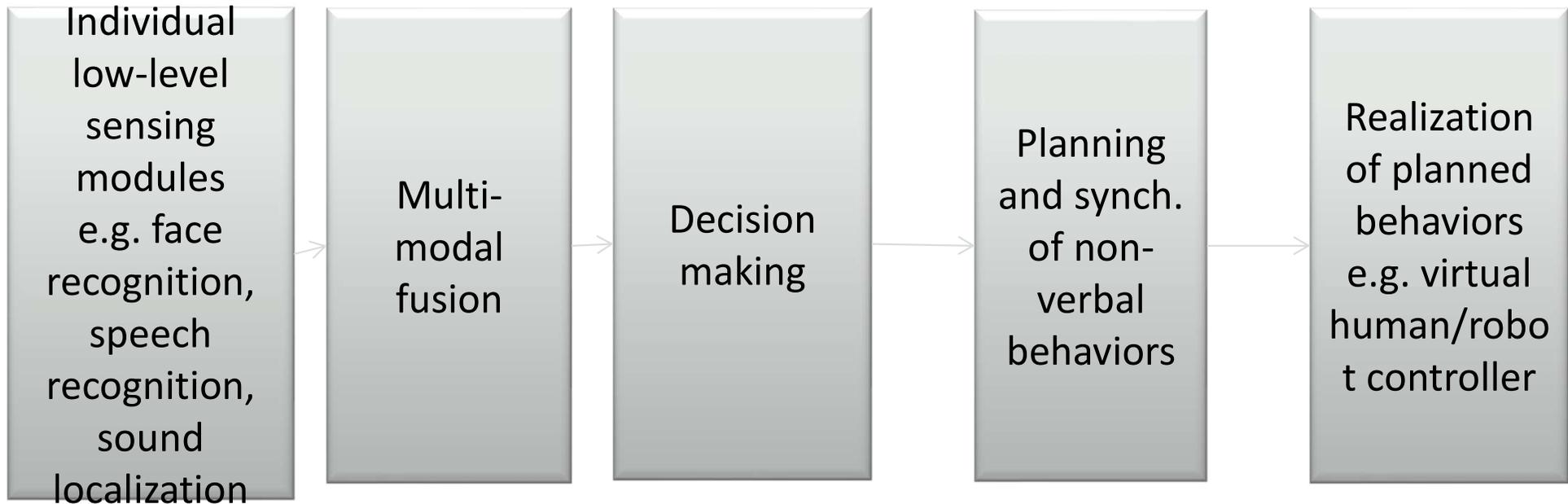


Becassine child  
robot, Singapore  
NTU (2017)



Nadine social Robot  
(2013-today) Singapore  
NTU and UNIGE

# Pioneer work on multi-modal interaction with social robot EVA (2007-2013)



# Pioneer Multimodal Research on social robot EVA on Vision, and Action in real-world Setting

- Eva was able to give interactive lectures, as for example in Geography, and recognize people with early **face recognition** models and a **memory model**.
- Since 2013, use of **Word embeddings vector technology developed by Google** that allows Eva and then Nadine to speak based on a numerical identification of each word with its semantic signification but **not dependent on the context**.



Eva conversational multimodal robot (2007-2013) UNIGE

Building long-term relationships with virtual and robotic characters: the role of remembering. Z Kasap, N Magnenat-Thalmann The Visual Computer 28 (1), 87-97, 2012

Word2Vec, Tomas Mikolov, Google, 2013

# The fabrication of Becassine child Robot (2017) NTU-Singapore

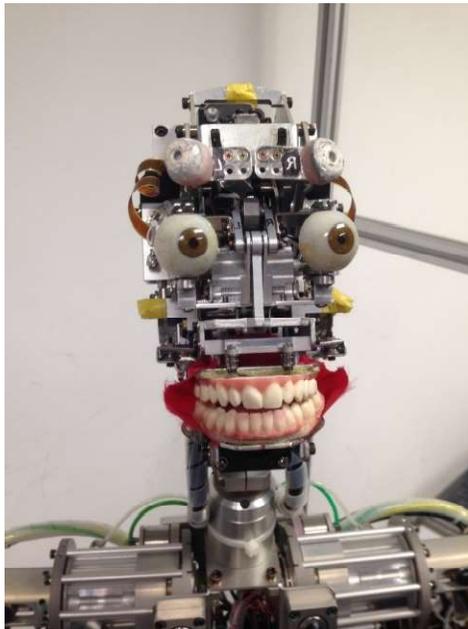
## Customization and Fabrication of the Appearance for Humanoid Robot

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Customization and fabrication of the appearance for humanoid robot S  
Guo, H Xu, N. Magnenat Thalmann, J Yao, the Visual Computer, 2017

# Nadine social robot (2013-2026) NTU Singapore Since 2022- University of Geneva

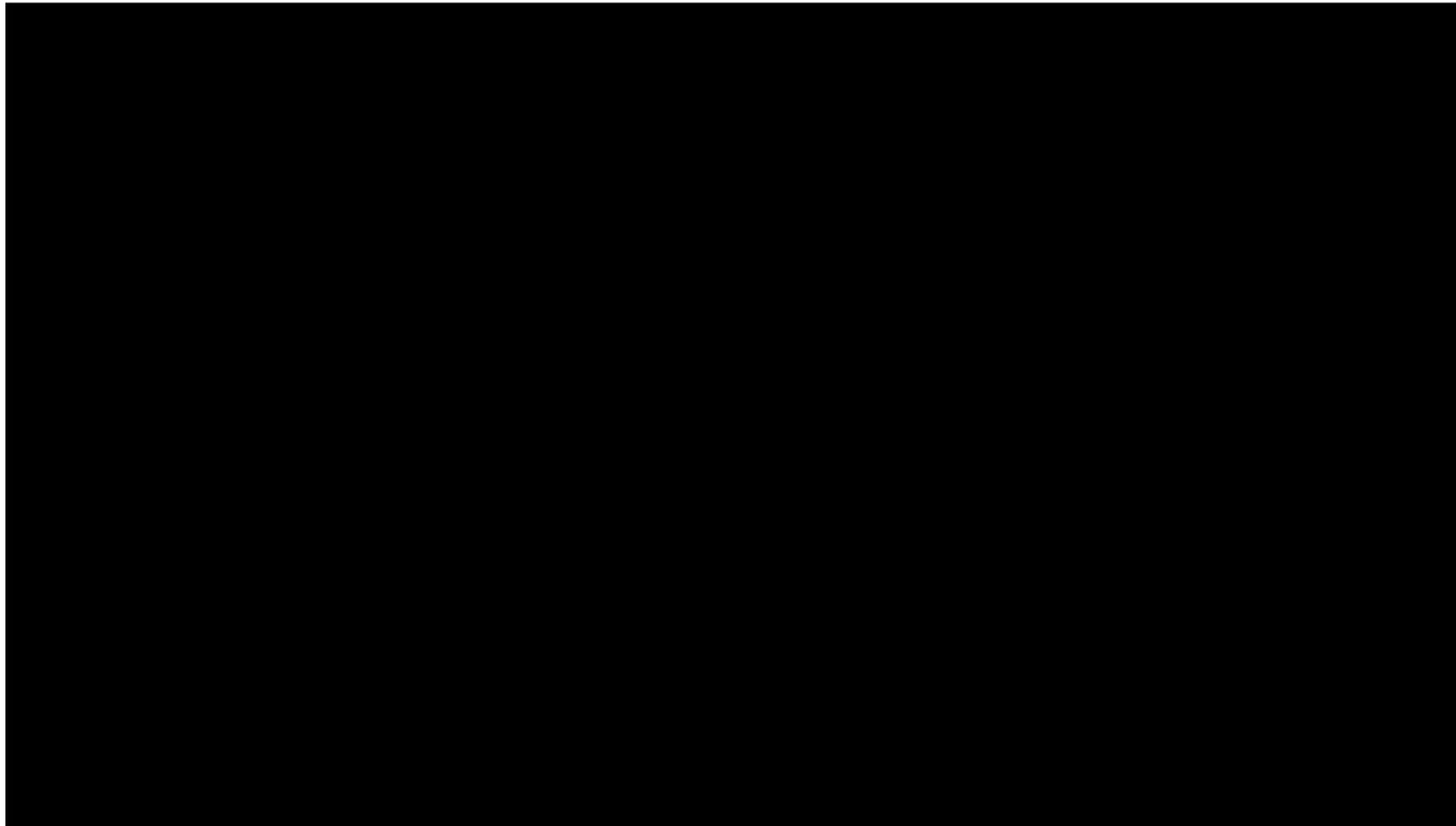
- ❖ Nadine created in Japan and Singapore.
- ❖ Pneumatic motors to display natural looking movements.
- ❖ Research on vision through sensors, personality models and memory



**Nadine Social Robot YouTube Channel**

[wikipedia.org/wiki/Nadine\\_Social\\_Robot](https://www.wikipedia.org/wiki/Nadine_Social_Robot)

# Nadine social robot : Innovations in multimodal interactions in various real-world settings from 2013-ongoing



Humanoid co-workers: How is it like to work with a robot?

Ajay Vishwanath, Aalind Singh, Yi Han Victoria Chua, Justin Dauwels, Nadia Magnenat-Thalmann, 2019, ROMAN Conference

# Narendra Modi, Prime Minister, India Interacting with Nadine Social Robot at NTU, Singapore



# Narendra Modi, Prime Minister, India Interacting with Nadine Social Robot at NTU, Singapore



# Nadine interacting with visitors at the ARTSCIENCE Museum in Singapore



# Nadine@ArtScience Museum's futuristic show



# Towards a full Multimodal AI Nadine Robot since 2018

- Until 2017, Nadine social robot is based on vision sensors and behavioral models and word embedding.
- Since 2018, new LLMs, Transformers and self Attention (Bert model that understands the language, developed by Google in 2018) are added.
- The principle of attention allows that each word is linked to all others, and that the language is geometrically digitally represented. Nadine starts to be able to speak naturally in several languages in any domain.



“**Attention is all needed**” by Ashish Vaswani and 7 authors, in Advances in Neural Information Processing Systems 30 (NIPS 2017)

“

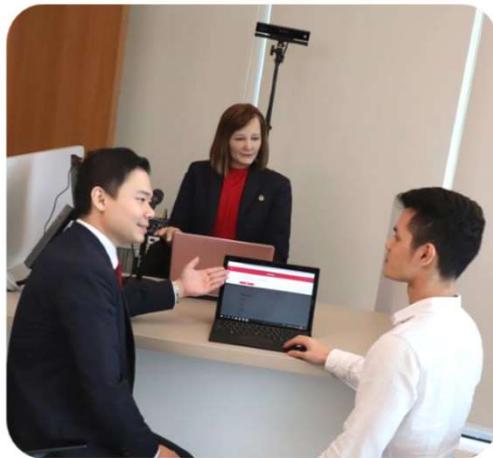
# Nadine at AIA Insurance Company in Singapore (2018)



Period of deployment: September 2018 – February 2019

Two specific modules were integrated to Nadine:

- Training to handle questions that are usually asked to AIA service agents
- Training to encourage AIA customers to sign up with AIA e-care registration portal

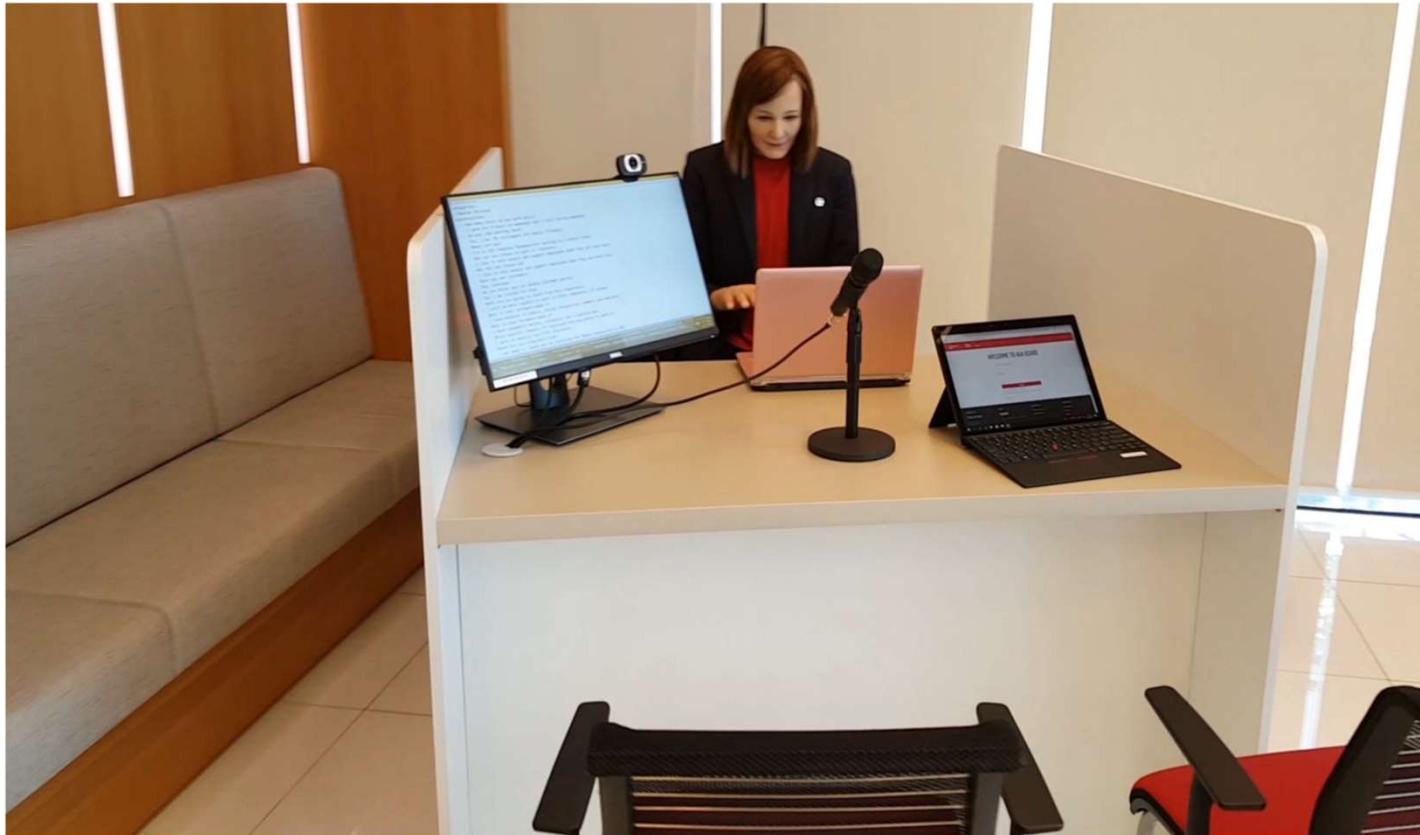


User case studies were conducted with colleagues and AIA customers' feedback were positive.

Vishwanath, A. Singh, J. Dauwels, Y. H. V. Chua and N. Magnenat Thalmann, [Humanoid co-workers: How is it like to work with a robot?](#), 28th IEEE International Conference on Robot and Human Interactive Communication (Ro-Man 2019), New Delhi, India, October 14 – 18, 2019

N. Mishra, M. Ramanathan, R. Satapathy, E. Cambria and N. Magnenat Thalmann, [Can a Humanoid Robot be part of Organizational Work Force? A User Study leveraging on Sentiment Analysis](#), 28th IEEE International Conference on Robot and Human Interactive Communication (Ro-Man 2019), New Delhi, India, October 14 – 18, 2019

# Research on action recognition and gesture recognition at AIA Insurance Company in Singapore (2018)



Yuyun Cai, Linhao Ge, Jianfei Cai, Nadia Magnenat Thalmann, Junsong Yuan, 3D Hand Pose Estimation using synthetic data and weakly labeled RGB images, *IEEE Trans. On Pattern Analysis and Machine Intelligence (PAMI)*, DOI:10.1109/TPAMI.2020.2993627, May, 2020

Hanhui Li, Xudong Jiang, Boliang Guan, Rui Ming Tan, Ruomei Wang, Nadia Magnenat Thalmann Joint Feature Optimization and Fusion for Compressed Action Recognition, *IEEE Trans. On Image Recognition*, Vol 30, 2021

# Nadine@Brighthill Elderly home in Singapore

**Objective:** Recognize residents 'gestures, their history, their emotions and help them to walk, to eat, to play bingo...

**Research:** modelling new human robotic hands, grasping, gestures, people and emotions recognition, natural dialog with Bert NLP, etc



**Can a humanoid social robot stimulate the interactivity of cognitively impaired elderly? A thorough study based on computer vision methods.** G Tulsulkar, N Mishra, NM Thalmann, HE Lim, MP Lee, SK Cheng, *The Visual Computer* ,37 (12), 3019-3038, 2021

L. Tian, J. Liu, N. Magnenat Thalmann, D. Thalmann and J. Zheng, **Design of a Flexible Articulated Robotic Hand for a Humanoid Robot**, 2019 *IEEE-RAS International Conference on Humanoid Robots (Humanoids)*, Toronto, Canada, October 15 – 17, 2019, **Best Paper Award**

# Nadine@Brighthill Elderly home in Singapore

**Objective:** Collaboration with social assistants from the elderly home to know elderly' needs. Nadine to help nurses when everybody is very busy.

**Nadine's duty:** to entertain elderly with Bingo game, show videos and play songs on demand, and to have personal discussions with elderly.



# Nadine@Brighthill Elderly home in Singapore showing empathy, and implicit comprehension



# Social multimodal Robot Nadine benefits from new LLMs since 2022

- Generative Pre-training (GPT) from OpenAI in 2018 shows that a large language model (LLM) can answer questions, translate, write text and program.
- The architecture used by GPT done by Google in 2018 ( “Attention is all you need”) has introduced the Transformer that allows to handle all words in parallel as vectors.
- 2022: Nadine new platform includes GPT and subsequent models of LLMs as ChatGPT, Mistral and others
- New research on Human-Inspired Context-selective Multimodal Memory is developed for Nadine



“Improving Language Understanding by Generative Pre-Training” published by OpenAI, 2018

“Language Models are FewShot Learners“, authors from OpenAI, NIPS'20: on Neural Information Processing Systems, 2020

# Nadine chatting at United Nations (ITU) AlforGood in Geneva (May 2024) with a new Agentic AI platform

- *Since 2024, the Nadine platform has been upgraded with capability of reasoning and answer complex questions.*

**Nadine is capable of interacting with external tools as databases for example. This agentic AI architecture allows Nadine to handle complex and diverse questions**



**ReAct paper:** Yao, Shunyu, et al. "React: Synergizing reasoning and acting in language models." *The eleventh international conference on learning representations*. 2022.

**SoR-ReAct paper:** H. Kang, M. Ben Moussa, N. Thalmann. "Nadine: A large language model-driven intelligent social robot with affective capabilities and human-like memory", CAVW, 2024

# Nadine at Global Platform for Disaster Risk Reduction, UN, Geneva, July 2025

With Ms Amina Mohammed, Deputy UN Secretary, Geneva



Nadine: A large language model-driven intelligent social robot with affective capabilities and human-like memory H Kang, M Ben Moussa, NM Thalmann, CAVW, 35 (4) 2024

Affective and Conversational Predictors of Re-Engagement in Human-Robot Interactions: A Student-Centered Study with a Humanoid Social Robot

H Kang, T Freitas, MB Moussa, NM Thalmann, Int. J. of Social Robotics, 2026, to appear

# The impact of Nadine on the workforce at IOE (International Organisation of Employers) in Geneva.

With the presence of:

Jean Milligan, Director of Partnerships and communication at IOE  
and Eric Loeb, Executive Vice President of Salesforce, USA



A powerful  
and balanced  
voice for business

# Nadine is waiting for your visit at the Swiss Pavillon

