CUI Activity Report 2019

1 – Team MIRALab - University of Geneva

- **Director**
  Prof. Nadia Magnenat-Thalmann

- **Assistants (PhD students)**
  Baka Evangelia
  Sénécal Simon

- **Developers / Designers**
  Cadi-Yazli Nedjma
  Arévalo Marlène

- **Administration**
  Grossrieder Coralie
  Giudicelli Elisabeth

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2 – Domain activities

- **Description of the activities of the laboratory research**
  MIRALab was founded in 1989 by Professor Nadia Magnenat-Thalmann and has brought together PhD students and researchers from different fields, such as computer science, 3D graphics, 3D simulation, social robotics, 3D fashion design, and cognitive science. This truly interdisciplinary group continues to work in the field of medical informatics, virtual worlds and virtual humans.

Since 1992, MIRALab has participated in more than 50 European Projects and contributes to the organization of two International Conferences, CASA and CGI.
In 2019, MIRALab was working on the European project ViMM (Virtual Multimodal Museum). This project is a major, high-impact Coordination and Support Action (CSA - 2016 - COOP-8) for Virtual Museums, within the overall context of European policy and practice on Digital Cultural Heritage. A highly expert seven partner consortium supported by a unique and powerful Advisory Group, consisting of many of the Europe and the world's leading public and private sector organisations in the field, has carried out work to help define and support high quality policies, strategic and day-to day decision making, the utilisation of breakthrough technological developments such as 3D/AR and to nurture an evidence-based view of growth and development impacted by DCH. This is supported by a set of 50 excellence examples and three regional case studies in culturally rich regions of South Europe recovering from economic recession. The results of this work are visible on the ViMM website www.vi-mm.eu and through its social media.

The following are some excerpts our work:

European project ViMM platform representation: Webpage with gallery
for case studies collection and Motion Capture category-based filter (selected option)

- **Website:** http://www.miralab.ch

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3 – PhD Thesis in preparation (Faculty of Sciences, mention interdisciplinary)

3.1 Simon Senecal

Simon Senecal is working on Learning dance through motion analysis in a virtual environment. Through the motion analysis of couples as entities with regards to tempos, we aim at developing new ways to understand and characterize partner dance.

We are proposing a set of features that can extract high-level information from low-level data, usable enough to help design learning systems (Fig. 1). In the first place, we selected three main dance skills considered important for Salsa dance learning from interviews with experts - namely Rhythm, Guidance, and Styling - and searched for clues in the theoretical description of the movement that could help to describe high-level dance skills in terms of low-level motion measurements. Next, we suggest a set of musicalrelated motion features (MMF) to characterize Salsa performance (two people interacting and dancing with each other to the music) in terms of learning levels. These features lead to 29 measurements applied to captured motion data and music beat analysis. Secondly, a database is created with 26 couples performing from three levels of experience (beginners: less than 6 months, intermediates: 1 to 3 years, experts: more than five years - teachers or jury) along with ten music with varying tempos. All MMFs are then extracted from the database and submitted to a machine learning algorithm. The "Random forest" algorithm shows the best results for level classification, up to 90% accuracy. A feature importance study is also conducted to enhance our MMF set by identifying the features that contribute the most to the classification.

Finally, we designed and evaluated an interactive dance learning system that allows a person to learn Guidance and Rhythm skills through a virtual reality Salsa dance environment containing a virtual partner with hand-to-hand interaction.
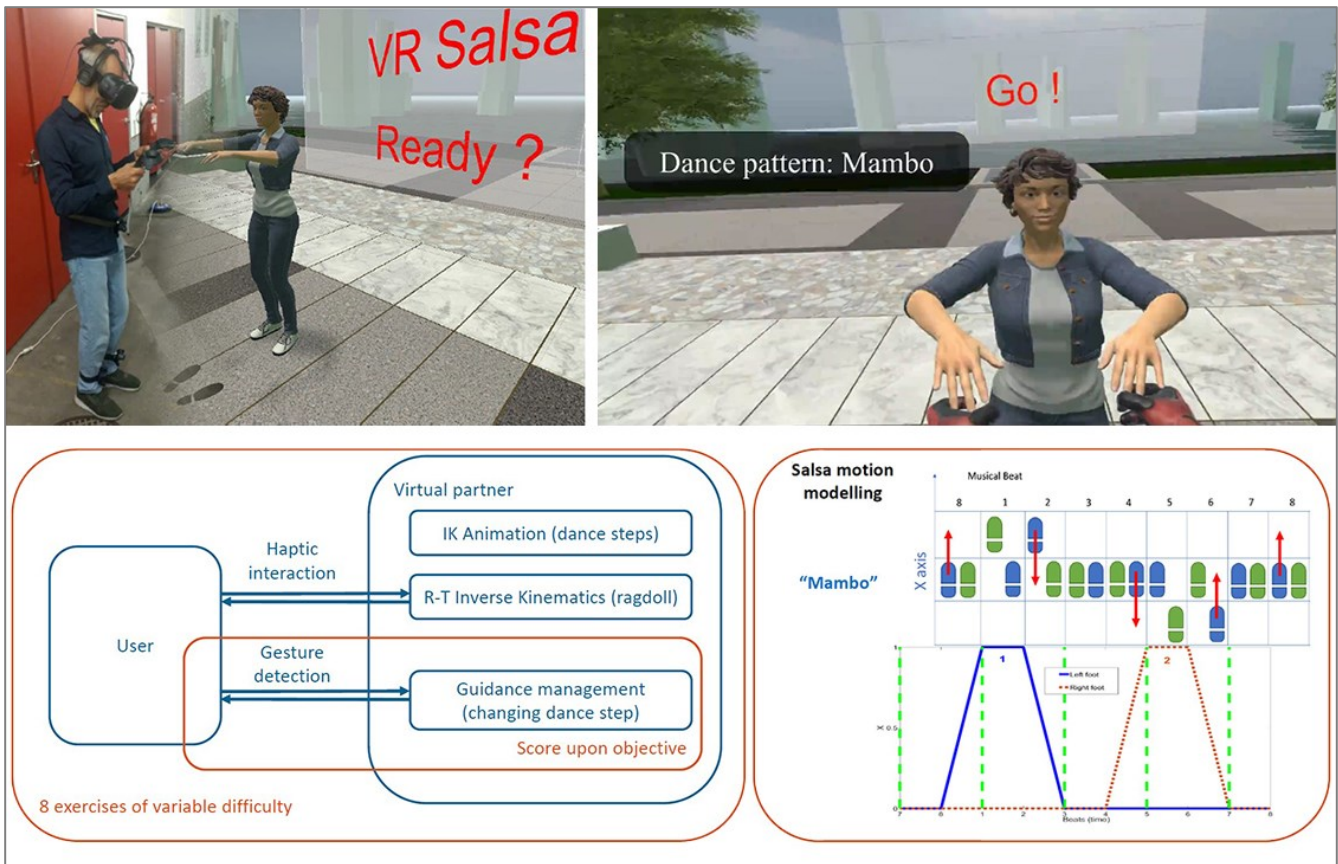
Fig. 1 Virtual reality interactive salsa dance learning system: Improvement of dance skills and performance evaluation.

3.2 Eva Baka

Evangelia Baka is working on human's perception and human's behavioral patterns towards several kind of interactions and technological environments, i.e virtual and physical environments, social robots and virtual avatars. A multimodal approach is used for the assessment and the validation of humans' reactions, such as brain signals (encephalography (EEG)), muscles activity (electromyography (EMG)), audio (voice recordings), motion (motion capture) and psychological indexes and emotions (questionnaire). The goal is firstly to define and decipher the complex social interaction process and then, to evaluate if technology can affect it. If yes, our purpose is to see how we react towards the different environments and agents and to propose some guidelines on how they could approach better and more efficiently humans. Our plan of work consists of 3 experiments, like shown in Fig. 1. We want to find the key point where humans accept social agents as a part of the social circle and social agents have as origin the human needs.
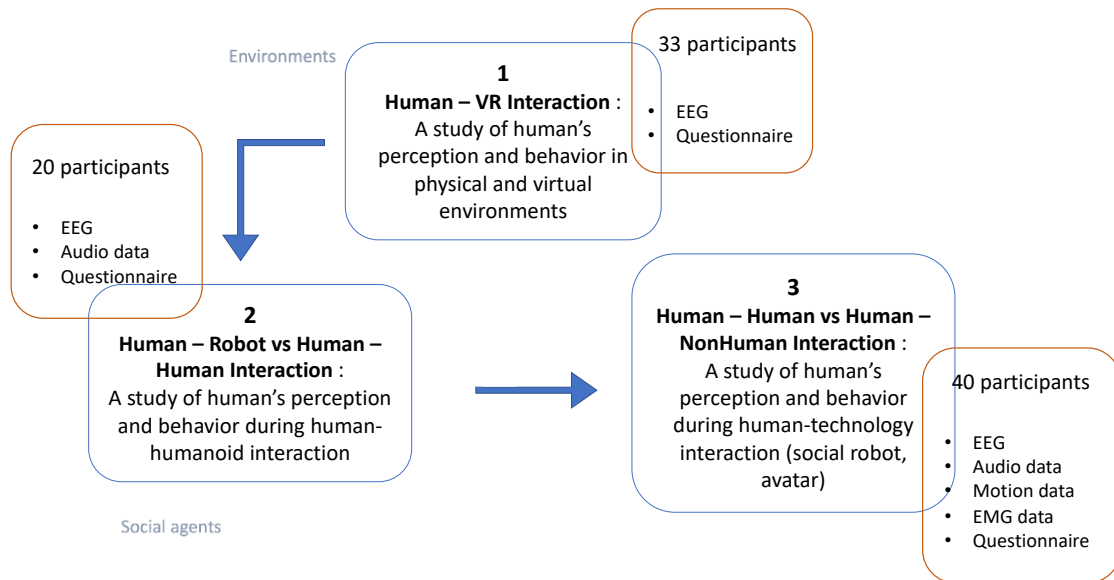
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Fig. 1 Overview of the three experiments conducted for the goal of the PhD thesis.
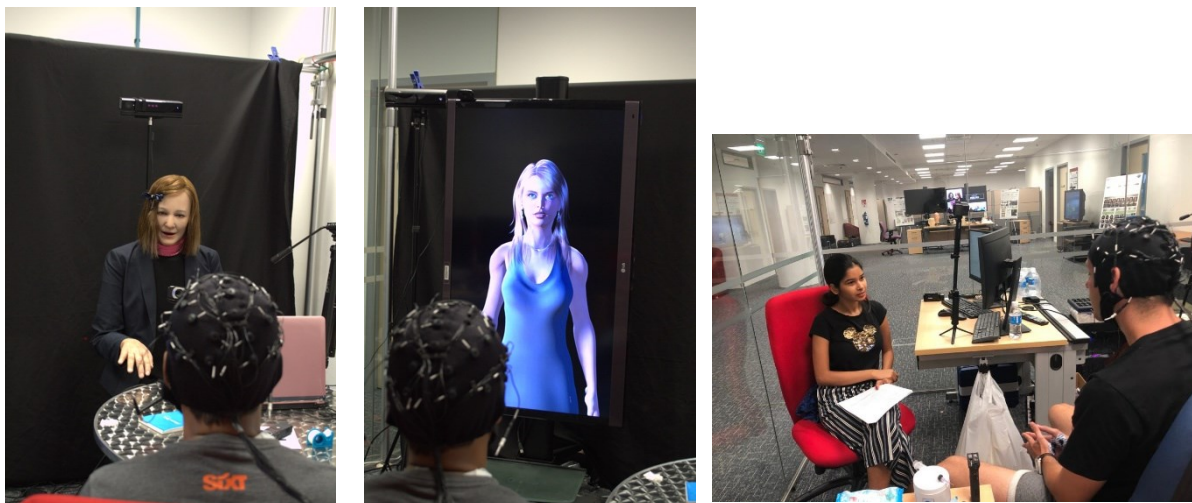

Fig. 2 Participants during the three cases of interaction. *LEFT*: case N where the participant interacted with Nadine social robot. *MIDDLE*: case VH where the participant had the experience of the virtual human and *RIGHT*: case H where the participant interacted with another real person

4 – List of publications Nadia Thalmann and al – Refereed papers in international journals

- N. Jain, A. Wydra, W. Hai, N. Magnenat-Thalmann and D. Thalmann, **Time scaled interactive object driven Multi-party VR**, The Visual Computer, DOI: 10.1007/s00371-

018-1539-1, Vol 34, Issue 6-8, pp. 887-897, May 04, 2018 (2nd Best Paper Award of CGI Conference 2018)

- M. Ramanathan, W.-Y. Yau, N. Magnenat Thalmann and E. K. Teoh, **mutually reinforcing motion-pose framework for pose invariant action recognition**, International Journal of Biometrics, DOI: 10.1504/IJBM.2019.099014, Vol. 11, No. 2, March 21, 2019

- M. Ramanathan, J. Kochanowicz and Nadia Magnenat Thalmann, **Combining Pose-Invariant Kinematic Features and Object Context Features for RGB-D Action Recognition**, International Journal of Machine Learning & Computing, Singapore (online journal)

- Y. Tahir, Z. Yang, D. Chakraborty, N. Thalmann, D. Thalmann, Y. Maniam, Nur Amirah binte Abdul Rashid, B.-L. Tan, J. L. C. Keong and J. Dauwels, **Non-verbal speech cues as objective measures for negative symptoms in patients with schizophrenia**, PLOS ONE, DOI: 10.1371/journal.pone.0214314, April 09, 2019 (IF:2.776)

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5 – List of publications – Full refereed papers in Conference Proceedings

- L. Tian, N. Thalmann, D. Thalmann and J. Zheng, **Design of a Highly Biomimetic and Fully-Actuated Robotic Finger**, The 2019 IEEE Symposium Series on Computational Intelligence (IEEE SSCI 2019), Xiamen, China, December 06 – 09, 2019

- Y. Cai, L. Ge, J. Liu, J. Cai, T.-J. Cham, J. Yuan and N. Magnenat Thalmann, **Exploiting Spatial-temporal Relationships for 3D Pose Estimation via Graph Convolutional Networks**, International Conference on Computer Vision, (ICCV'19), Seoul, South Korea, October 27 – November 02, 2019

- H. Ding, X. Jiang, A. Liu, N. Thalmann and G. Wang, **Boundary-Aware Feature Propagation for Scene Segmentation**, International Conference on Computer Vision, (ICCV'19), Seoul, South Korea, October 27 – November 02, 2019

- 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

- A. 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

- S. Xu, Z. Yang, D. Chakraborty, Y. H. V. Chua, J. Dauwels, D. Thalmann, N. Magnenat Thalmann, B.-L. Tan, J. Lee, **Automated Verbal and Non-Verbal Speech Analysis of Interviews of Individuals with Schizophrenia and Depression**, 41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'19), Berlin, Germany, July 23 – 27, 2019

- M. Ramanathan, N. Mishra and N. Magnenat Thalmann, **Nadine Humanoid Social Robotics Platform**, Proceedings of the 36th Computer Graphics International (CGI 2019), Springer, Calgary, Canada, June 17 – 20, 2019 Prof. Nadia Magnenat Thalmann List Publications 26/05/2020 15

- E. Baka, A. Vishnawath, N. Mishra, G. Vleioras and N. Magnenat Thalmann, **Am I Talking to a Human or a Robot?: A Preliminary Study of Human's Perception in Human-Humanoid Interaction and Its Effects in Cognitive and Emotional States**, Proceedings of the 36th Computer Graphics International (CGI 2019), Springer, Calgary, Canada, June 17 – 20, 2019

- L. Tian, N. Magnenat Thalmann, D. Thalmann, Z. Fang and J. Zheng, **Object Grasping of Humanoid Robot Based on YOLO**, Proceedings of the 36th Computer Graphics International (CGI 2019), Springer, Calgary, Canada, June 17 – 20, 2019

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6 – List of publications – Full refereed papers in Tutorials, Panels and Workshops

- International Innovation Summit, panel on **Smart Dialogue #2: Human Intelligence vs Artificial Intelligence**, Resorts World Sentosa, Singapore, December 04 – 05, 2019 (https://www.dropbox.com/s/flanm9mr323wxcs/Panelist_International%20Innovation%20Summit.pdf?dl=0)

- Property Guru Asia Real Estate Summit, panel on **Tech Disruptors: solutions that are transforming the way we build, to the way we live**, The Athene Hotel, Bangkok, Thailand, November 21 – 22, 2019 (https://www.dropbox.com/s/cbi4jnedfpe63h1/Panelist_PropertyGuru%20Asia%20Real%20Estate%20Su mmit.pdf?dl=0)

- HR Innovation Week 2019, panel on **The Future of Human-AI Collaboration in HR**, Amara Sanctuary Resort Sentosa, Singapore, September 17 – 20, 2019 (https://www.dropbox.com/s/ilzuhg33znb5928/Panelist_HR%20Innovation%20Week%202019.pdf?dl=0)

- 36th Computer Graphics International (CGI 2019), panel on **The Future of Computer**

Graphics in the Age of AI and Social Media, University of Calgary, Calgary, Alberta, Canada, June 17 – 20, 2019
(https://www.dropbox.com/s/jeug98q2xiazt16/Panelist_CGI%202019.pdf?dl=0)

- 4GAMECHANGERS FESTIVAL 2019, panel on **Generation AI: Taking the Next Step In Human Evolution. Can Imperfect Humans Create Perfect Intelligence?**, MARX HALLE, Austria, April 11, 2019
(https://www.puls4.com/4GAMECHANGERS/Videos/4GAMECHANGERS/Session-Generation-AI-Takingthe-next-step-in-human-evolution.-Can-imperfect-humans-create-perfectintelligence?utm_campaign=4gamechangers&utm_content=20190411_4GC_SESSION_GENERATION_AI&utm_medium=social&utm_source=facebook&utm_term=social_post)

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10/11 – International and national advisory boards committees

2019	Member of the Scientific Advisory Board of the **Computer Science Department of Shanghai Tech University**, China
2019	Member of the Advisory Board for the **ANA Avatar XPRIZE,** USA
2016-2019	Member of the IAB Committee of the **Computer Science Dpt of Technical University of Vienna,** Austria
2013-2020	Expert on the advanced grant panel in Computer Science**, European Research Council (ERC) Brussels**, Belgium
2007-2020	Expert and reviewer of the **Seventh Framework Programme FP7, European Commission**, Belgium
2002- Present	Member of the **Strategic Advisory Board Committee, City University, and Hong Kong**, China
2000-Present	Member of the **"3ème cycle romand d'informatique", Conférence universitaire de la Suisse occidentale (CUSO),** Switzerland
1994- Present	President of the Computer Graphics Association (CGS)

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12 – PhD Thesis committees

- **Evangelia Baka**, Director Prof. Nadia Magnenat-Thalmann, University of Geneva,

Switzerland

- **Simon Sénécal,** Director Prof. Nadia Magnenat-Thalmann, University of Geneva, Switzerland

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13/14 – Conference/Program Chair and Festival Chair

June 2019   Conference Co-Chair, **36th Annual International Computer Graphics International (CGI 2019)**, Calgary, Alberta, Canada

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15 – Refereeing
(Include any review for Journal)

- Jury of Ph.D. thesis for New Zealand, France, Sweden, Switzerland and Germany

- European Union, FP7 Projects, Brussels

- Research Grants Council of Singapore

- Natural Sciences and Engineering Research Council of Canada

- National Science Foundation USA

- Swiss National Research Foundation

- Austrian Research Foundation

- ACM SIGGRAPH, IEEE Transactions on Visualization and Computer Graphics, IEEE Computer Graphics and Applications, IEEE Computer, Communications of ACM, The Visual Computer, Computer Graphics Forum, Computer Vision, Graphics and Image Processing, Presence, International Journal of Human-Computer Studies, Computers and Graphics, cyberworlds conference, ICAART (International Conference on Agents and Artificial Intelligence), Enactive conference, Multimedia Modelling conference, International Conference on Entertainment Computing (ICEC), International Conference on Signal Processing, Image Processing and Pattern Recognition; GRAPP ("International Conference on Computer Graphics Theory and Applications), Conference on Affective Computing and Intelligent Interaction (ACII 2010), EG Workshop on 3D Object Retrieval, IEEE Virtual Reality Conference 2010, Computer Graphics International, CASA conference, SIGGRAPH/EUROGRAPHICS Symposium on Computer Animation, etc.

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16 – Editorial Responsibilities

2014-Present   Associate Editor, **Frontiers in Robotics,** Nature Publisher

2010-Present   Editorial Adviser of the journal of **Graphical Models** published by Elsevier

2000-Present   Editor-in-Chief of the Journal **The Visual Computer** published by Springer Verlag, Germany

2000-Present   Editor of the Journal of **Computational Geometry** published by Elsevier, Holland

1995-Present   Editor, Computational Geometry Journal, North Holland

1990-Present   Co-founder and Co-editor-in-chief, **Computer Animation and Virtual Worlds**, John Wiley and Sons

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17 – Events organised in Geneva

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18 – Invited talks

- Keynote speaker at the Symposium on Humans and Machines, Prospects for our Digital Future, Year 1919- 2019 Women Study, **from Antiquity to Humanoid Social Robots: a Dream of Humanity**, Technical University, Vienna, Austria, October 29, 2019 (https://www.dropbox.com/s/4udy231omlrz7rv/Keynote_Symposium%20on%20Humans%20and%20Machines%2C%20Prospects%20for%20our%20Digital%20Future.pdf?dl=0)

- Invited speaker at the Digital 365 @ Singtel, **Smart humanoids: Past, Present, Future**, Singtel Comcentre, Singapore, October 21, 2019

- Keynote speech at the Trescon Global's World AI Show, **Smart humanoids: Past, Present, Future**, Marina Bay Sands, Singapore, July 24, 2019 (https://www.dropbox.com/s/rbsugkrlw0lptvo/Keynote_Trescon%20Global%E2%80%99s%20World%20AI %20Show%202019.pdf?dl=0)

- Invited speaker at the Future Smart Future Workforce Learning Festival, **Humanoid**

Robots: What For, What Next? OCBC Campus, Singapore, July 08, 2019 (https://www.youtube.com/watch?v=_wGaZw69zUQ)

- Keynote speech at the 7th International Symposium of Chinese CHI (Chinese CHI 2019), **Humanoid social robots: What can they do? What are their limitations? What is their future?**, Xiamen University, Xiamen, China, June 27 – 30, 2019 (https://www.dropbox.com/s/14qksx30ovs4gn3/Keynote_Chinese%20CHI%202019.pdf?dl=0)

- Keynote speech at the 36th Annual Conference in Computer Graphics International (CGI 2019), **Social Humanoid Robots: What for, What next?**, University of Calgary, Calgary, Alberta, Canada, June 17 – 20, 2019 (https://www.dropbox.com/s/8xe33qvurls7a04/Keynote_CGI%202019.pdf?dl=0)

- Invited Panelist at the **Future of Ageing, Nobel Prize Dialogue meeting**, bringing together a unique constellation of Nobel Laureates, world-leading scientists, policy makers and thought leaders to discuss global issues that affect us all. Madrid, 22 May 2019, https://www.nobelprize.org/events/nobel-prize-dialogue/madrid-2019

- Invited speaker at the Disrupt @ The Bay, Education Disrupt 2019 presented by DBS Business Class, **AI and social robotics – from dream to reality and its impact on society**, DBS Auditorium, L3 Marina Bay Financial Centre Tower 3, Singapore, May 16, 2019 (https://www.dropbox.com/s/605u6up8rqsucrj/Invited%20Speaker_DBS%20Disrupt%20%40%20The%20 Bay.pdf?dl=0)

- Invited talk at Clariden Global's 2nd Applying Artificial Intelligence and Deep Learning for Enterprises Conference, **The Intersect of Artificial Intelligence with Robotics: Latest Advances**, Pan Pacific Singapore, Singapore, May 15, 2019 (https://www.dropbox.com/s/2q2xvcn8yyiq4zw/Invited%20Speaker_Clariden%20Global%202nd%20Applying%20Artificial%20Intelligence%20and%20Deep%20Learning%20for%20Enterprises%20Conference.pdf ?dl=0)

- Keynote speech at the 7th China (Shanghai) International Technology Fair (CSITF), **AI and social Robotics: a global view**, Shanghai World Expo Exhibition & Convention Center, Shanghai, China, April 18 – 20, 2019 (https://www.dropbox.com/s/9gusr52gof39v3t/Keynote_CSITF%202019.pdf?dl=0)

- Invited speaker at the Rendez-vous de Casablanca de l'Assurance 2019, **la robotique, l'intelligence artificielle, où allons-nous?**, Hyatt Regency Hôtel, Casablanca, Maroc, April 03 – 04, 2019 (https://www.dropbox.com/s/5vnmn9zgjd24fgz/Invited%20Speaker_Rendezvous%20de%20Casablanca%20de%20l%27Assurance%202019.pdf?dl=0)

- Invited talk at the 9th ACADEMIA SUPERIOR PLENUM, Surprise Factors Symposium 2019, **Predictive Futures: Measuring the Future**, Gmunden, Austria, March 30, 2019

- (https://www.dropbox.com/s/7r7uwgxj2t4arz7/Invited%20Speaker_9th%20ACADEMIA%20SUPERIOR%2 0PLENUM.pdf?dl=0)
(https://www.instagram.com/p/BunuFlfBEA0/)

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19 / 20 – Participation in TV and Radio Programs and Press Release

- **Nadine a socially intelligent human looking robot.,**
  stumagz, 04 June 2018

- **World AI Leaders from Dell Technologies, Rolls-Royce and Kryon, among others, discuss AI Strategies in Singapore,**
  Retail News Asia, Aug 05, 2019
  (https://www.dropbox.com/s/kz808omsaq4lcki/Retail%20News%20Asia_050819_World%20AI%20Leaders%20from%20Dell%20Technologies%2C%20RollsRoyce%20and%20Kryon%2C%20among%20others%2C%20discuss%20AI%20Strategies%20in%20Sing apore.pdf?dl=0)

- **OCBC Bank co-designs program to groom 200 data scientists and analysts,**
  Human Resources, Jul 09, 2019
  (https://www.dropbox.com/s/yy80uhfglwp3egg/HumanResources_090719_OCBC%20Bank%20codesigns%20programme%20to%20groom%20200%20data%20scientists%20and%20analysts.pdf?dl=0)

- **Nadine, el robot que muy pronto estará presente en residencias del mundo entero,**
  65ymas.com, Jun 09, 2019, Spanish
  (https://www.dropbox.com/s/1zm9b3h13zmozth/65ymas.com_090619_Nadine%2C%20el%20robot%20que%20muy%20pronto%20estar%C3%A1%20presente%20en%20residencias%20del%20mundo%20ente ro.pdf?dl=0)

- **Wir Menschen brauchen Hilfe von Robotern,**
  Salzburger Nachrichten, Apr 10, 2019, German
  (https://www.dropbox.com/s/lbj4yvykc1zyclv/Salzburger%20Nachrichten_100419_Wir%20Menschen%20 brauchen%20Hilfe%20von%20Robotern.pdf?dl=0)

- **Commentary: Countries are not responding well to automation,**
  Channel NewsAsia, Jan 28, 2019
  (https://www.dropbox.com/s/wbi2hm98qst6lqn/Channel%20NewsAsia_280119_Commentary%20Countries%20are%20not%20responding%20well%20to%20automation.pdf?dl=0)

- **Meet the trailblazing humanoid robots in AIA Singapore's customer service centers**,

Singapore Business Review, Jan 22, 2019
(https://www.dropbox.com/s/lnvnmk29v3qpw2y/Singapore%20Business%20Review_2 20119_Meet%20the%20trailblazing%20humanoid%20robots%20in%20AIA%20Singap ore%27s%20customer%20servic e%20centres.pdf?dl=0)

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21 – Funded research projects – Participation to European projects

- **ViMM**
  Virtual Multimodal Museum
  Period: October 2016 - March 2019
  Type: European Research
  Website: http://vi-mm.eu/
  MIRALab Total budget: CHF 199'701.-
  MIRALab Budget 2019: CHF 19'970.-

  Partners (7 partners):
  - Cyprus University of Technology (CUT) – Cyprus
  - Foundation for Research and Technology Hellas (FORTH-ICS) – Greece
  - 7Reasons Medien Gmbh - Germany
  - MIRALab, University of Geneva (UNIGE) – Switzerland
  - Stifung Preussischer Kulturesizt – Germany
  - Universidad Pompeu Fabra – Spain
  - 7scenes – Netherlands