

Boston, Massachusetts

+43 (699) 11407208

+1 (857) 2030601

tamas.madl@gmail.com

linkedin.com/in/tamasmadl

github.com/tmadl

www.cs.man.ac.uk/~madlt

# Tamas Madl

## Experience

2016 **Consultant**, *Insight Health Data Science*, Boston, MA

- Researching and designing high-impact altruistic health data science projects
- Developing and teaching workshops in machine learning and data science

2016 **Fellow**, *Insight Health Data Science*, Boston, MA

- Developed *heartshield.net*, an app recognizing heart disease using heart activity inferred from webcam video
- Trained model on MIT PhysioNet ECG data, using non-linear metric learning method developed during PhD
- Challenging validation: scraped news reports (5300) of heart attacks (300), downloaded interview videos (27), performed face detection, and extracted heart rates. Also gathered videos from Amazon MTurk (120)
- Filtered large amount of noise, computed statistical features, applied non-linear metric and kNN classification
- Outperformed Random Forests (49%) and 1-class SVMs (70%), achieving 79% accuracy, training the model on heartbeat intervals from ECG and testing on heartbeats from video data
- Deployed an interactive front end using Flask, jQuery, and d3.js on Google App Engine

2013 **Principal Investigator**, *Austrian Research Institute for Artificial Intelligence*, Vienna, Austria

2016

Spatial Memory and Navigation Ability in a Physically Embodied Cognitive Architecture.

- Secured 340.000 \$ government grant usually awarded to professors and postdoctoral researchers (P25380-N23)
- Developed a brain-like computer model of spatial memory in Python able to control a humanoid Atlas robot in the DARPA VRC simulator, and reproducing human behavior data, based on the LIDA model of cognition (including road and object recognition using convolutional neural networks and a novel map correction algorithm)
- Developed infrastructure (in-browser 3D virtual environments, three.js) and optimal experimental design engine (active learning with uncertainty sampling), and gathered data from hundreds of participants online
- Integrated data from geospatial sources (OpenStreetMaps, Google Maps, Directions, Roads, Places API)
- Implemented the first predictive model of spatial memory structure (only explanatory models existed before), using Bayesian nonparametric clustering with a novel non-linear metric learning method, robustly (78%) predicting buildings represented together by an individual (based on building name/address, using public APIs)
- Contributed two new computational mechanisms to the LIDA model of human cognition
- Supervised a postgraduate researcher for one year

2011 **Postgraduate Researcher**, *Austrian Research Institute for Artificial Intelligence*, Vienna, Austria

2012

Investigating Requirements for Context-Awareness and an Attempt to Implement it in Software Agents or Robots.

- Published a design for a moral decision making system for robots, and implemented a prototype in Java
- Developed a cognitive model simulating a mobile assistive robot for elderly or sick patients based on LIDA
- Contributed a persistence feature storing models as byte streams, and a novel (published) model of an attentional phenomenon, to the computational framework of the LIDA model of human cognition

2010 **Web Programmer**, *invevo GmbH*, Vienna, JS/extJS, AJAX, PHP, HTML, CSS

2011

Extended an online Enterprise Resource Planning app with front-end controls, including

- an interactive Gantt chart using extJS, AJAX and PHP

2009 **Web Programmer**, *biz:Consult GmbH*, Vienna, PHP, JS, AJAX, SQL, HTML, CSS

2010

Developed UI extensions for the CRM app using JS and HTML, integrated with MySQL using PHP and AJAX,

- including live updating HTML forms for searching and displaying DB entries and for entering customer data

2008 **Web Programmer**, *Skypark Secure Ltd*, Blackpool, (PHP, HTML, CSS)

2009

Template implementation (in HTML & CSS), extension of the payment processing system (PHP)

## Skills

Coding Python, JavaScript, PHP, HTML, CSS, Java, MATLAB, C#.NET, SQL (some experience), C/C++

Tools scikit-learn, Numpy, Matplotlib, Pandas, Flask, Django, jQuery, Brian (spiking neural nets), AWS

Models Semi-supervised & non-linear metric learning, Bayesian models, nonparametric clustering, SVM, RF

## Achievements

2013 **Project grant P25380-N23**, FWF (*Austrian Science Fund*)

2016

- 2014 ● Best paper award runner-up, *University of Manchester, UK*
- 2011 ● PhD scholarship, *University of Manchester, UK*
- 2015 ● Scholarship of Achievement, *University of Vienna, 2010, 2011*
- 2010 ● Scholarship of Achievement, *University of Vienna, 2010, 2011*
- 2011 ● 2nd, 3rd and 5th place, *Austrian Physics Olympiad (2008, 2007, 2006)*
- 2006 ● 2nd, 3rd and 5th place, *Austrian Physics Olympiad (2008, 2007, 2006)*
- 2008 ● 2nd, 3rd and 5th place, *Austrian Physics Olympiad (2008, 2007, 2006)*

## Education

- 2011 ● PhD in Computer Science, *University of Manchester, UK*
- 2016 ● PhD in Computer Science, *University of Manchester, UK*
- 2009 ● MSc in Cognitive Science, *University of Vienna, Austria*
- 2011 ● MSc in Cognitive Science, *University of Vienna, Austria*
- 2008 ● BSc in Computer Science, *University of Central Lancashire, UK*
- 2009 ● BSc in Computer Science, *University of Central Lancashire, UK*

## PhD Thesis

title ***Bayesian Mechanisms in Spatial Cognition: Towards real-world capable computational cognitive models of spatial memory.*** Supervisors: Dr. Ke Chen, Prof. Daniela Montaldi

description How do brains learn where things are, despite sensory noise and spatial complexity? This thesis argues that they use Bayesian mechanisms, and provides evidence that brain cells representing space can perform Bayesian inference and filtering. It shows that human spatial memory structure can be predicted by clustering in psychological space. The cognitive model presented shows how brains might estimate, correct, and structure representations of space. To demonstrate real-world ability, the accuracy of this model is compared with human data in realistic humanoid robot simulations, modelled after real cities.

## Conference Publications

- 2016 ● Madl, T. "Network analysis of heart beat intervals using horizontal visibility graphs". In: *Computing In Cardiology*.
- 2013 ● Madl, T, S Franklin, K Chen, and R Trapp. "Spatial Working Memory in the LIDA Cognitive Architecture". In: *International Conference on Cognitive Modeling (ICCM)*.
- 2012 ● Madl, T and S Franklin. "A LIDA-based Model of the Attentional Blink". In: *ICCM*.

## Journal Publications

- 2016 ● Madl, T, S Franklin, K Chen, D Montaldi, and R Trapp. "Towards real-world capable spatial memory in the LIDA cognitive architecture". In: *Biologically Inspired Cognitive Architectures*.
- 2016 ● Madl, T, Franklin S, K Chen, R Trapp, and D Montaldi. "Exploring the structure of spatial representations". In: *PLoS ONE*.
- 2015 ● Madl, T, K Chen, D Montaldi, and R Trapp. "Computational Cognitive Models of Spatial Memory in Navigation Space: A Review". In: *Neural Networks* 65, pp. 18–43.
- 2014 ● Madl, T, S Franklin, K Chen, D Montaldi, and R Trapp. "Bayesian Integration of Information in Hippocampal Place Cells". In: *PLoS ONE* 3, e89762.
- 2013 ● Franklin, S, T Madl, S D'Mello, and J Snider. "LIDA: A Systems-level Architecture for Cognition, Emotion, and Learning". In: *IEEE TAMD* 6.1, pp. 19–41.
- 2011 ● Madl, T, B J Baars, and S Franklin. "The Timing of the Cognitive Cycle". In: *PLoS* 6.4, e14803.

## Book Chapters

- 2016 ● Madl, T, S Franklin, J Snider, and U Faghihi. "Continuity and the Flow of Time - A Cognitive Science Perspective". In: *Philosophy and Psychology of Time*. Springer.
- 2015 ● Madl, T and S Franklin. "Constrained Incrementalist Moral Decision Making for a Biologically Inspired Cognitive Architecture". In: *A Construction Manual for Robots' Ethical Systems*. Vol. 1. Springer.