



**Nicola Pezzotti**  
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#### Computer science and programming skills

C++  
Algorithmics  
Deep Learning  
Python  
JavaScript  
TypeScript  
Qt  
OpenGL  
GPGPU  
Arduino  
Linux Development  
Windows Development

#### Website

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Gagelboschplein 535  
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The Netherlands

#### Date of birth

17/06/1986

#### Nationality

Italian

#### Languages

Italian  
English

#### References

Dr. A. Vilanova  
Computer Graphics and  
Visualization Group  
Delft University of  
Technology  
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Prof. B. Lelieveldt  
Division of Image  
Processing  
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Prof.dr. J.D. Fekete  
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INRIA  
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# Nicola Pezzotti

**About Me** I was 13 years old when I started coding and I could never stop. I enjoy writing code that is scalable and solves real-world problems.

## Professional experience

### Research Intern, Google AI, Switzerland

February 2018 - June 2018

I worked with Alexander Mordvintsev, the creator of Google's DeepDream project, on the interpretability of Deep Neural Networks. I developed a new approach for analyzing the output of deep neural networks that is released as a module of the TensorFlow.js library.

### Visiting Researcher, INRIA Project Team AVIZ, France

April 2017 - June 2017

I worked with professor Jean-Daniel Fekete on the development of the Progressive Visual Analytics paradigm for the analysis of large data collections. This work powered analytics system for the analysis of deep learning models and large networks.

### PhD Candidate, Delft University of Technology, The Netherlands

September 2014 - November 2018 (expected or earlier)

My research consists in the development of scalable manifold-learning algorithms for the analysis of extremely large data, such as medical datasets, social-networks, text corpora and deep neural networks. My algorithms and systems were presented in the most important visual analytics venues and are used by medical researchers for the analysis of real-world data. Thanks to the Hierarchical Stochastic Neighbor Embedding (HSNE) algorithm that I developed, we were able to identify previously unknown immune-system cell types. This result was achieved by scaling up the number of cells that could be analyzed with a manifold-learning algorithm from a few thousands to several millions. HSNE is also the cornerstone of DeepEyes, a system for the visual analysis of deep neural networks during training that I developed. My algorithms are mainly implemented in C++ and are released as part of the High-Dimensional-Inspector library.

### Research & Development Engineer, Open Technologies S.R.L, Italy

July 2011 - August 2014

I was responsible of the development of the high-end real-time scanner *Insight3* I optimized the algorithms developed during my Research Fellowship and developed several Arduino-based systems for the on-board control of *Insight3*. Furthermore, I contributed to the development of the computational-geometry module of the Open Technologies S.R.L. proprietary library and I was in charge of the control versioning and the release of the company's main software.

### Research Fellow, University of Brescia, Italy

September 2011 - August 2012

I developed proprietary algorithms for the real-time computation of implicit surfaces on the GPU. These algorithms are designed to work with off-the-shelf and real-time scanning devices like the Microsoft Kinect and the PrimeSense Carmine and Capri. Furthermore, I devised a proprietary passive stereo system that led to the development of the *Insight3* high-quality real-time scanner. Due to the strict real-time requirements all the developed algorithms were implemented in C++, CUDA and Thrust.

## Awards

### Silver Medal, Italian Olympiad in Informatics

March 2005

Italian selection for the International Olympiad in Informatics (IOI).

## Education

### MSc in Software Engineering, University of Brescia, Italy

2009-2011

For my master thesis I worked on the development of fast and automatic tools for the alignment of 3D data such as point clouds, meshes and range images. This work was done in collaboration with the company Open Technologies S.R.L.

I graduated with a final grade of 110/110.

### BSc in Information Engineering, University of Brescia, Italy

2005-2009

For my bachelor thesis I developed a library for interprocess communication between real-time applications working in Linux-Xenomai and other Linux applications. This work was done in collaboration with the company G2L S.R.L.

## Personal interests

Long-distance running, cycling, board gaming, reading, coding competitions, traveling.

## **Featured Publications**

### **Differentiable Image Parameterizations**

A. Mordvintsev, N. Pezzotti, L. Schubert, C. Olah  
to appear in *Distill.pub* 2018,  
*Interactive Journal for Machine Learning Interpretation*.

### **Linear tSNE optimization for the Web**

N. Pezzotti, A. Mordvintsev, T. Höllt, B. Lelieveldt, E. Eisemann, A. Vilanova  
*ArXiv* 2018 and to appear in *Google AI blog* 2018

### **DeepEyes: Progressive Visual Analytics for Designing Deep Neural Networks**

N. Pezzotti, T. Höllt, J. van Gemert, B. Lelieveldt, E. Eisemann, A. Vilanova  
*Transaction on Visualization and Computer Graphics, Proc. of IEEE VIS* 2017

### **Hierarchical Stochastic Neighbor Embedding**

N. Pezzotti, T. Höllt, B. Lelieveldt, E. Eisemann, A. Vilanova  
*Computer Graphics Forum, Proceedings of EuroVIS* 2016

### **Interactive Visual Analysis of Mass Cytometry Data by Hierarchical Stochastic Neighbor Embedding Reveals Rare Cell Types**

V. van Unen\*, T. Höllt\*, N. Pezzotti\* et al.  
*Nature Communications* 2017

### **Approximated and User Steerable tSNE for Progressive Visual Analytics**

N. Pezzotti, B. Lelieveldt, L. van der Maaten, T. Höllt, E. Eisemann, A. Vilanova  
*Transaction on Visualization and Computer Graphics, Presented at IEEE VIS* 2016

## **Dagstuhl Seminars**

Dagstuhl seminars are invitation-only events where world leading computer scientists gather to brainstorm on hot topics and technologies in computer science.

### **Progressive Data Analysis and Visualization - October 2018**

Seminar on large scale information retrieval and analysis with a focus on artificial intelligence.

## **Tutorial**

### **Blending Visualization with Data Mining and Machine Learning for Biomedical Data Analysis 2018**

Topic: *Visual Analytics from Feature Design to Deep Neural Networks Understanding*  
International Conference On Medical Image Computing  
and Computer Assisted Intervention (MICCAI)

## **Technical Committee**

### **Smart Tools and Applications in Graphics 2018**

Eurographics Italian Chapter with a focus on Machine Learning for Graphics

## **Review Service**

### **Smart Tools and Applications in Graphics 2018**

Eurographics Italian Chapter with a focus on Machine Learning for Graphics

### **EuroVis 2018**

European conference on Scientific Visualization, Information Visualization and Visual Analytics.

### **IEEE VIS 2017**

Worldwide largest and most important conference on Scientific Visualization, Information Visualization and Visual Analytics.

## Other Publications

### **Multiscale Visualization and Exploration of Large Bipartite Graphs**

N. Pezzotti, J.D. Fekete, T. Höllt, B. Lelieveldt, E. Eisemann, A. Vilanova  
*Computer Graphics Forum 2018*

### **Mass Cytometry Reveals Innate Lymphoid Cell Differentiation Pathways in the Human Fetal Intestine**

N. Li et al.  
*Journal of Experimental Medicine 2018*

### **Interactive Visual Exploration of 3D Mass Spectrometry Imaging Data Using Hierarchical Stochastic Neighbor Embedding Reveals Spatiomolecular Structures at Full Data Resolution**

W. M. Abdelmoula, N. Pezzotti, T. Hölt, J. Dijkstra, A. Vilanova, L. A McDonnell, B. Lelieveldt  
*Journal of Proteome Research 2018*

### **CyteGuide: Visual Guidance for Hierarchical Single-Cell Analysis**

T. Höllt, N. Pezzotti, V. van Unen, F. Koning, B. Lelieveldt, A. Vilanova  
*Transaction on Visualization and Computer Graphics, Proc. of IEEE VIS 2017*

### **BrainScope: Interactive Visual Exploration of the Spatial and Temporal Human Brain Transcriptome**

S. Huisman, B. van Lew, A. Mahfouz, N. Pezzotti, T. Höllt, L. Michielsen, A. Vilanova, M. JT Reinders, B. Lelieveldt  
*Nucleic Acids Research 2017*

### **Employing Visual Analytics to Aid the Design of White Matter Hyperintensity Classifiers**

R. Raidou, H. Kuijf, N. Sepasian, N. Pezzotti, W. Bouvy, M. Breeuwer, A. Vilanova  
*International Conference on Medical Image Computing and Computer-Assisted Intervention 2016*

### **Cytosplore: Interactive Immune Cell Phenotyping for Large Single-Cell Datasets**

T. Höllt, N. Pezzotti, V. van Unen, F. Koning, E. Eisemann, B. Lelieveldt, A. Vilanova  
*Computer Graphics Forum, Proceedings of EuroVIS 2016*

### **Poisson-Driven Seamless Completion of Triangular Meshes**

M. Centin, N. Pezzotti, A. Signoroni  
*Computer Aided Geometric Design 2015*

### **On-the-Fly Automatic Alignment and Global Registration of Free-Path Collected 3D Scans**

F. Bonarrigo, N. Pezzotti, A. Signoroni  
*Digital Heritage International Congress 2013*

### **Boosting the Computational Performance of Feature-Based Multiple 3D Scan Alignment by IAT-k-Means Clustering**

N. Pezzotti, F. Bonarrigo, A. Signoroni  
*3D Imaging, Modeling, Processing, Visualization and Transmission 2012*