



# Irene Viola

RESEARCHER

## PROFILE

I am a postdoctoral researcher at Centrum Wiskunde & Informatica. My interests lay in multimedia compression, transmission and quality evaluation. My research is currently focused on Quality of Experience (QoE) metrics and methodologies for immersive multimedia systems (i.e., volumetric video for XR applications).

## CONTACT

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## WORK EXPERIENCE

POSTDOCTORAL RESEARCHER @ CENTRUM WISKUNDE & INFORMATICA (CWI)  
August 2019 - Present

**GROUP:** Distributed and Interactive Systems

**RESEARCH INTERESTS:** Metrics and methodologies to measure and predict the Quality of Experience (QoE) of immersive media representations, such as point clouds, in real-time multimedia systems.

POSTDOCTORAL RESEARCHER @ ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE (EPFL)  
May 2019 - July 2019

**GROUP:** Multimedia Signal Processing Group

**RESEARCH INTERESTS:** Visual quality assessment and compression for light field and point cloud contents, and deep learning methods for image

VISITING RESEARCHER @ NAGOYA UNIVERSITY  
June 2018 - August 2018

**SUPERVISOR:** Prof. Toshiaki Fujii

**RESEARCH INTERESTS:** Evaluation of rendering-dependent compression solutions for light field displays.

DOCTORAL CANDIDATE @ ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE (EPFL)  
September 2015 - April 2019

**GROUP:** Multimedia Signal Processing Group

**RESEARCH INTERESTS:** Light field compression and transmission, visual quality evaluation for immersive media

## EDUCATION

PhD in ELECTRICAL AND ELECTRONIC ENGINEERING @ ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE (EPFL)  
September 2015 - April 2019

**ADVISOR:** Prof. Touradj Ebrahimi

**THESIS:** Compression and visual quality assessment for light field contents

The goal of the thesis is to provide an analysis of various methodologies for quality assessment of light field contents, to evaluate the compression capabilities of various encoding solutions, and to propose a new method to improve the coding efficiency for light field contents.

MSc in COMPUTER ENGINEERING @ POLYTECHNIC UNIVERSITY OF TURIN  
September 2013 - October 2015

**ADVISORS:** Prof. Martin Vetterli, Ecole Polytechnique Federale de Lausanne (EPFL), Prof. Enrico Magli, Polytechnic University of Turin

**THESIS:** A dataset for image super-resolution

**GPA:** 3.87/4.00

**GRADE:** 110/110

BSc in CINEMA AND MEDIA ENGINEERING @ POLYTECHNIC UNIVERSITY OF TURIN  
September 2010 - July 2013

**GPA:** 3.69/4.00

**GRADE:** 109/110

## SCOLARSHIPS AND AWARDS

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MKS INSTRUMENTS RESEARCH EXCELLENCE AWARD  
2017

EPFL EDIC FELLOWSHIP  
2015

EUROPEAN INNOVATION ACADEMY (EIA), FULL SCOLARSHIP  
2015

ERASMUS+ AND SWISS-EUROPEAN MOBILITY PROGRAMME  
SCOLARSHIP  
2014

EDISU FULL UNIVERSITY SCHOLARSHIP  
2010-2015

WINNER OF THE TRINITY COLLEGE LONDON OLYMPICS  
2010

## PROJECTS

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VRTOGETHER (EU HORIZON 2020)  
August 2019 - November 2020

My role in the project is to develop Quality of Experience (QoE) metrics and evaluation methods to qualitatively assess the social VR experiences. <https://vrtogether.eu/>

EUROPEAN NETWORK ON QUALITY OF EXPERIENCE IN MULTIMEDIA  
SYSTEMS AND SERVICES (QUALINET)  
2017 - Present

Leader of Task Force 7: Immersive Media Experiences (IMEx). The goal of the task force is to identify use cases and application domains in the area of immersive media experiences, and to identify different QoE aspects in immersive experiences, developing new QoE models and QoE assessment approaches. The efforts are culminating in a white paper on Definitions of Immersive Media Experiences.

DIGITAL EYE: DEEP LEARNING VIDEO QUALITY ASSESSMENT TECHNOLOGY (SWISS COMMISSION FOR TECHNOLOGY AND INNOVATION)  
March 2019 - July 2019

My work in this project was to assist on quantization solutions for deep learning-based image compression, and to conduct subjective assessment of compression solutions based on crowdsourcing.

ADVANCED VISUAL REPRESENTATION AND CODING IN AUGMENTED AND VIRTUAL REALITY (SWISS NATIONAL FOUNDATION FOR SCIENTIFIC RESEARCH)  
March 2019 - July 2019

My work on this project was on compression and visual quality assessment of volumetric media, with a focus on light field and point cloud representation.

LIVE: LIGHT FIELD IMAGE AND VIDEO CODING AND EVALUATION (SWISS NATIONAL FOUNDATION FOR SCIENTIFIC RESEARCH)  
March 2016 - March 2019

My focus on this project was on immersive methodologies for subjective quality assessment of light field contents, particularly under coding artifacts, and on novel compression solutions for transmission and storage of light field images.

## STANDARDIZATION

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### JOINT PICTURE EXPERT GROUP (JPEG) - ISO SC29/WG1 2016 - Present

Participant in the Ad Hoc Group on JPEG Pleno - Light Field

Authored input documents:

WG1M72022: Grand challenge on light field image compression  
WG1M74023: Subjective Evaluation Methodology for JPEG Pleno CfP  
WG1M75037: JPEG Pleno Anchor Evaluations EPFL  
WG1M75073: JPEG Pleno Anchors subjective evaluation  
WG1M76059: JPEG Pleno Overview of objective and subjective results for CfP on LF Coding  
WG1M76070: JPEG Pleno CfP on LF - Overview  
WG1M76071: JPEG Pleno CfP on LF - Subjective Evaluation EPFL  
WG1M76072: JPEG Pleno CfP on LF - Objective Evaluation  
WG1M76073: JPEG Pleno CfP on LF - Cross-correlation results  
WG1M78025: JPEG-XS EPFL Subjective Test Results  
WG1M78026: JPEG-XS EPFL Subjective Test Results Presentation  
WG1M79042: JPEG Pleno LF CE3.2b Results - EPFL  
WG1M84027: JPEG Pleno LF Coding Core Experiment 7.6 Report UFRJ-IME-UFF-IT-SRBR-EPFL

### MOTION PICTURE EXPERT GROUP (MPEG) - ISO SC29/WG11 2019 - Present

### VIDEO QUALITY EXPERT GROUP (VQEG) 2019 - Present

Participant in the Immersive Media Group

Collaborated in submission to ITU SG12/Q13, Recommendation P.360-VR

## OPEN SCIENCE

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### DATASETS

Quality assessment for point cloud compression (2019). Available here:  
<https://www.epfl.ch/labs/mmspg/downloads/quality-assesment-for-point-cloud-compre-ssion/>

VALID: Visual quality Assessment for Light field Images Dataset (2018). Available here:  
<http://www.epfl.ch/labs/mmspg/VALID>

### OPEN-SOURCE IMPLEMENTATIONS

A color-based objective quality metric for point cloud contents (2020). Available here:  
<https://github.com/ireneviola/point-cloud-color-metric>

Light field translation codec (2019). Available here:  
<https://github.com/mmspg/light-field-translation-codec>

Light field tensor display simulator (2019). Available here:  
<https://github.com/mmspg/LFDisplaySimulator>

Light field graph codec (2018). Available here:  
<https://github.com/mmspg/light-field-graph-codec>

Testbed for interactive quality assessment of light field contents (2017). Available here:  
<https://github.com/mmspg/light-field-tracking>

## PUBLICATIONS

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### JOURNAL PUBLICATIONS

Alexiou, E., **Viola, I.**, Borges, T.M., Fonseca, T.A., de Queiroz, R.L. and Ebrahimi, T., 2019. A comprehensive study of the rate-distortion performance in MPEG point cloud compression. *APSIPA Transactions on Signal and Information Processing*, 8.

**Viola, I.**, Řeřábek, M. and Ebrahimi, T., 2017. Comparison and evaluation of light field image coding approaches. *IEEE Journal of selected topics in signal processing*, 11(7), pp.1092-1106.

### CONFERENCE PUBLICATIONS

**Viola, I.**, Subramanyam, S. and Cesar, P., 2020, May. A color-based objective quality metric for point cloud contents. In *2020 Twelfth International Conference on Quality of Multimedia Experience (QoMEX)* (pp. 1-6). IEEE.

Subramanyam, S., Li, J., **Viola, I.** and Cesar, P., 2020, March. Comparing the quality of highly realistic digital humans in 3DoF and 6DoF: A volumetric video case study. In *2020 IEEE Conference on Virtual Reality and 3D User Interfaces (VR)* (pp. 127-136). IEEE.

**Viola, I.**, Mulder, J., Simone, F. and César Garcia, P.S., 2019, December. Temporal Interpolation of Dynamic Digital Humans using Convolutional Neural Networks. In *2019 IEEE International Conference on Artificial Intelligence and Virtual Reality (AIVR)* (pp. 90-907). IEEE.

Hériard-Dubreuil, B., **Viola, I.** and Ebrahimi, T., 2019, November. Light field compression using translation-assisted view estimation. In *2019 Picture Coding Symposium (PCS)* (pp. 1-5). IEEE.

**Viola, I.**, Takahashi, K., Fujii, T. and Ebrahimi, T., 2019, September. Rendering-dependent compression and quality evaluation for light field contents. In *Applications of Digital Image Processing XLII (Vol. 11137, p. 111371I)*. International Society for Optics and Photonics.

**Viola, I.** and Ebrahimi, T., 2019, June. An in-depth analysis of single-image subjective quality assessment of light field contents. In *2019 Eleventh International Conference on Quality of Multimedia Experience (QoMEX)* (pp. 1-6). IEEE.

**Viola, I.**, Takahashi, K., Fujii, T. and Ebrahimi, T., 2019, January. A comprehensive framework for visual quality assessment of light field tensor displays. *Electronic Imaging*, 2019(10), pp.310-1.

**Viola, I.**, Maretic, H.P., Frossard, P. and Ebrahimi, T., 2018, September. A graph learning approach for light field image compression. In *Applications of Digital Image Processing XLI (Vol. 10752, p. 107520E)*. International Society for Optics and Photonics.

Willème, A., Mahmoudpour, S., **Viola, I.**, Fliegel, K., Pospíšil, J., Ebrahimi, T., Schelkens, P., Descampe, A. and Macq, B., 2018, September. Overview of the JPEG XS core coding system subjective evaluations. In *Applications of Digital Image Processing XLI (Vol. 10752, p. 107521M)*. International Society for Optics and Photonics.

Upenik, E., **Viola, I.** and Ebrahimi, T., 2018, September. A rendering solution to display light field in virtual reality. In *2018 26th European Signal Processing Conference (EUSIPCO)* (pp. 246-250). IEEE.

**Viola, I.** and Ebrahimi, T., 2018, September. Comparison of Interactive Subjective Methodologies for Light Field Quality Evaluation. In *2018 26th European Signal Processing Conference (EUSIPCO)* (pp. 1865-1869). IEEE.

**Viola, I.** and Ebrahimi, T., 2018, July. Quality assessment of compression solutions for ICIP 2017 Grand Challenge on light field image coding. In *2018 IEEE International Conference on Multimedia & Expo Workshops (ICMEW)* (pp. 1-6). IEEE.

**Viola, I.** and Ebrahimi, T., 2018, May. VALID: Visual quality assessment for light field images dataset. In *2018 Tenth International Conference on Quality of Multimedia Experience (QoMEX)* (pp. 1-3). IEEE.

**Viola, I.** and Ebrahimi, T., 2017, September. A new framework for interactive quality assessment with application to light field coding. In Applications of Digital Image Processing XL (Vol. 10396, p. 103961F). International Society for Optics and Photonics.

**Viola, I.**, Řeřábek, M. and Ebrahimi, T., 2017, May. Impact of interactivity on the assessment of quality of experience for light field content. In 2017 Ninth International Conference on Quality of Multimedia Experience (QoMEX) (pp. 1-6). IEEE.

**Viola, I.**, Řeřábek, M., Bruylants, T., Schelkens, P., Pereira, F. and Ebrahimi, T., 2016, December. Objective and subjective evaluation of light field image compression algorithms. In 2016 Picture Coding Symposium (PCS) (pp. 1-5). IEEE.

**Viola, I.**, Řeřábek, M. and Ebrahimi, T., 2016, September. A new approach to subjectively assess quality of plenoptic content. In Applications of Digital Image Processing XXXIX (Vol. 9971, p. 99710X). International Society for Optics and Photonics.

## TEACHING

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### TEACHING ASSISTANT

2013 - 2019

I have been a teaching assistant and tutor for Calculus and Algebra courses for bachelor students at the Polytechnic University of Turin, and I have served as the responsible assistant on the courses Image and Video Processing and Media Security at the Ecole Polytechnique Federale de Lausanne.

### LECTURER

2017 - 2019

I have served as a lecturer in the Image and Video Processing course, and in the QoE-Net summer school on QoE management and implementation, at the Ecole Polytechnique Federale de Lausanne.

### STUDENT SUPERVISION

2016 - Present

Shishir Subramanyam, Adaptive Streaming of Dynamic Point Clouds for Social Virtual Reality (2020, PhD Thesis)

Nacho Reimat, Temporal interpolation of human point clouds using neural networks and body part segmentation (2020, Master Thesis)

Baptiste Hériard-Dubreuil, Building a light field compression solution (2019, Master Project)

## REVIEWER

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### JOURNAL PUBLICATIONS

IEEE Transactions on Image Processing, IEEE Transactions on Multimedia, IEEE Journal of Emerging and Selected Topics in Circuits and Systems, IEEE Signal Processing Letters, IEEE Transactions on Circuits and Systems for Video Technology.

### CONFERENCE PROCEEDINGS

International Conference on Multimedia and Expo (ICME), International Conference on Image Processing (ICIP), Data Compression Conference (DCC), International Conference on Quality of Multimedia Experience (QoMEX).

## INVITED TALKS

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### SEMINARS

Compression and visual quality assessment for light field contents. Host: Prof. Piotr Didyk, Università della Svizzera italiana. Lugano, Switzerland, 2019.

Quality of experience for light field contents. Host: Prof. Toshiaki Fujii, Nagoya University. Nagoya, Japan, 2018.

### CONFERENCE PRESENTATIONS

Temporal Interpolation of Dynamic Digital Humans using Convolutional Neural Networks. In IEEE International Conference on Artificial Intelligence and Virtual Reality (AIVR). San Diego, USA, 2019.

An in-depth analysis of single-image subjective quality assessment of light field contents. In Eleventh International Conference on Quality of Multimedia Experience (QoMEX). Berlin, Germany, 2019.

Comparison and evaluation of light field image coding approaches. In IEEE International Conference on Image Processing (ICIP). Athens, Greece, 2018.

VALID: Visual quality assessment for light field images dataset. In Tenth International Conference on Quality of Multimedia Experience (QoMEX). Sardinia, Italy, 2018.

A new framework for interactive quality assessment with application to light field coding. In SPIE Optics + Photonics. San Diego, USA, 2017.

Impact of interactivity on the assessment of quality of experience for light field content. In Ninth International Conference on Quality of Multimedia Experience (QoMEX). Erfurt, Germany, 2017.

Objective and subjective evaluation of light field image compression algorithms. In Picture Coding Symposium (PCS). Nuremberg, Germany, 2016.

## OTHER

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### SKILLS

**Programming Languages:** MATLAB, Python, Java, Bash, Javascript, C/C++, HTML/CSS  
**Softwares:** FFMpeg, Blender, LaTeX, Git, Adobe Photoshop, Adobe Illustrator  
**Operating Systems:** Linux, MacOS, Windows

### LANGUAGES

**Full working proficiency:** English (C2)  
**Intermediate proficiency:** Greek (B1)  
**Elementary proficiency:** French (A2)  
**Native proficiency:** Italian

### MISCELLANEOUS

Amateur subtitles translator (tv comedies are my favourite!)  
Radio host for OndeQuadre's popular university radio program Zapping! (2014)  
Graphic advisor for the Italian Red Cross  
Co-organiser of a convention on web writing, sponsored by Rome Municipality III