Richard Modrzejewski

PhD and Engineer in Computer Vision & Data Scientist

Education

2016-2020 **PhD in Computer Vision**, *Clermont Auvergne University*, Clermont-Ferrand, France,
Deformable registration, datasets, and evaluation protocols for augmented minimally invasive abdominal surgery.

2012-2015 **Engineering degree in Computer Science and Applied Mathematics**, *INP ENSEEIHT*, Toulouse, France,
Specialization in Multimedia.

2014-2015 **Master IACI : Master of Research in Artificial Intelligence**, *Paul Sabatier University*, Toulouse, France.

2009-2012 **Preparatory classes for admission to engineering schools**, *Fabert High School*, Metz, France,
*MPSI/MP**.

Work Experience

2021-Today **Data Science Technical Manager**, *SurgAR*, Clermont Ferrand, France

- Design, implementation and integration of a pipeline for collecting medical data from partner hospitals to the cloud of the company.
  - Implementation of the Google Cloud Platform infrastructure associated with the data pipeline.
  - Project leader for the development of surgical video anonymization and metadata addition software, developed in C++/Qt.
  - Project leader for the development of data access software for medical personnel and researchers who need to request this data, developed in PHP/Symfony.
  - Participation in the deployment, maintenance, and monitoring of a software solution for annotating medical data on the Google Cloud Platform infrastructure.
- Design of a Python template for integrating artificial neural networks used in the medical devices developed by the company, their training, and evaluation.
- Organizing scientific meetings with different teams within the company.
- Writing procedures and support documents related to the company's Data Science activity in order to comply with the ISO 62304 and 13485 standards.
- Supervision of research projects associated with the development of artificial neural networks to be used in the company's current and future software.
  - Detection and segmentation of anatomical structures of the uterus.
  - Classification of identifying frames in surgical videos.
  - Detection of peritoneal cancer lesions in laparoscopic images.
- Scientific watch associated with advances in the field of artificial intelligence and its use within medical devices
- Participation in the implementation of the cybersecurity strategy for the company and its software.

2020-2021 **R&D Engineer**, *SurgAR*, Clermont Ferrand, France

- Participation in the development of augmented reality software for computer-assisted laparoscopic gynaecological surgery.
- Participation in writing procedures and support documents related to the Design and Development activities of the company in order to comply with the ISO 62304 and 13485 standards.

2016-2020 **Doctorant**, *Pascal Institute and IHU Strasbourg*, Clermont Ferrand and Strasbourg, France

Completion of a PhD thesis in collaboration with the EnCoV team at the Pascal Institute in Clermont-Ferrand and the Computer Vision research team at the IHU Strasbourg. This PhD thesis is entitled «Deformable registration, datasets, and evaluation protocols for augmented minimally invasive abdominal surgery» and has led to the realization of various contributions.

- Development of a deformable registration solution from an initial model configuration to a scene where the model is seen in a deformed configuration by modeling the mechanical properties and behavior of the model.
- Adaptation of the proposed solution in order to be used for the registration of a patient on the surgical table.
- Participation in the integration of this solution into research prototypes used by IHU.
- Development of a surface reconstruction solution using Multi-View Stereo with photometric constraints in the context of laparoscopic surgery.
- Creation of datasets and evaluation protocols associated with the different achievements of the PhD.

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2016 **R&D Engineer**, *Devatics*, Toulouse, France
Participation in the development of an online platform for analyzing user behavior on e-commerce websites.

2015 **Intern in Computer Vision**, *CNRS-AIST-JRL*, Tsukuba, Japan
Six-month internship with the objective of using an RGB-D camera to detect and compute poses of reflective surfaces in images. These poses are then used to deduce the position of a humanoid robot in the scene on which the camera was mounted, and thus augmenting the final image by using a human avatar replacing the visual of the robot.

Theoretical skills

Computer vision

Projective geometry • 3D reconstructions • Feature matching • Photometry • Rigid and non-rigid registration methods • Mechanical modeling •

Numerical optimization methods • Algebraix optimization methods • Camera calibration • Light modeling • Medical imaging • Structure from Motion (SfM) • SLAM

Machine Learning

Image segmentation • Object classification • Object detection • Deep learning • Recurent Neural Network (RNN) • Long Short Term Memory Networks (LSTM) •

Attention Mechanism • Transformers • Active Learning • Support Vector Machines (SVM) • Genetic algorithm • Multi-Agent Systems

Project Management and Operational Approaches

Agile Methodologies • Scrum • Kanban • Test-Oriented Methodologies (Behavior-Driven Development, Test-Driven Development) • DevOps • MLOps

Computer skills

Languages

PYTHON • C++ • CUDA • OpenGL • BASH • PHP • C • JavaScript • Google Apps Script • SQL• TypeScript • MATLAB • LaTeX

Mastery of Software Libraries

OpenCV • Pytorch • Ceres • VTK • Symfony • Qt • NodeJS

Web page description

HTML • CSS

Mastery of software

Project management tools

Monday • Jira • Coda

Development tools

Google Cloud Platform (GCP) • Git • GitHub • Docker

Others

Blender • MITK • Gmsh • MeshLab • Google workspace • Figma

Languages

French	Native language
English	C1 level, professional skills
Japanese	Beginner level

Hobbies

Board games • Cinema • Chess • Reading

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