Antonin Vobecky

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vobecant.github.io

Research interests

Computer vision, machine learning, language-image alignment, open-vocabulary semantic segmentation, 3D from 2D, multi-modal models (image, language, 3D, and more)

Education

2019–today **Ph.D. student**, *CTU in Prague*, Prague, Czech Republic
Supervisors: Josef Sivic and Patrick Peréz
ELLIS Ph.D. student
Topics: open-vocabulary semantic segmentation, 3D from 2D, image-language models, multi-modal models, self-supervised and weakly supervised learning
Thesis: Weakly supervised learning for visual recognition
Publications: [1, 2, 3] *Collaborations:* [4, 5, 6, 7, 8]
Visits: valeo.ai ('21,'22,'23,'24), working with Andrei Bursuc, Oriane Siméoni and Spyros Gidaris

Selected projects

Open-Vocabulary 3D Occupancy [1]

We developed a machine learning model that uses images, 3D scans, and language to create 3D maps of environments. This technology enables object searches using text descriptions. We show applications in autonomous driving.

Unsupervised semantic segmentation [2]

Annotation of data used to train machine learning models is very costly. To tackle this, we develop a machine learning model that performs image segmentation using only images during the inference without any annotated data during the training. The key is using the easily (in autonomous driving) accessible 3D LiDAR signal during training.

2017–2019 **Master degree in Computer Vision and Image Processing**, *Czech Technical University in Prague*, Prague, Czech Republic
graduated with distinctions
Internship at Valeo Prague
Publications: [9], *Collaborations:* [10]
Selected project

Dataset augmentation using generative networks [9]

Machine learning models require large amounts of annotated data. In this project, we extended the training dataset used to train a machine-learning model. To achieve this, we used generative neural networks, which led to an improved model's performance.

2014–2017 **Bachelor degree in Robotics**, *Czech Technical University in Prague*, Prague, Czech Republic
graduated with distinctions distinctions, dean's award for the thesis
Publications: [11]
Selected project

Detecting decision ambiguity from facial images [11]

We proposed a method for detecting decision ambiguity through facial analysis, leveraging a dataset from the TV show "Who Wants to Be a Millionaire?" to identify uncertainty and hesitation in contestants. We generated the annotations automatically from onscreen graphics.

Research collaborators

CTU Prague	Josef Sivic, Jiri Matas
Kyutai	Patrick Pérez
Meta FAIR	Oriane Siméoni
valeo.ai	Andrei Bursuc, Spyros Gidaris, Gilles Puy

Working experience

Jul.'17–Sep.'17 **Summer Research Intern**, *CTU in Prague, VRG*, Prague, Czechia
Summer student research internship in the VRG group led by Jiri Matas.

Sep.'17–ongoing **Student Researcher**, *Valeo*, Prague, Czechia
Research in computer vision algorithms for autonomous cars.

Activities

2020-today **Journal reviewing**, IJCV

2020-today **Conference reviewing**, CVPR, ECCV, NeurIPS, RA-L

Awards

2023 ICVSS 2023 essay competition winner

2017 Valeo scholarship for talented students.

Skills

Programming Python, Matlab, Linux shell

Machine learning PyTorch, Tensorflow, scikit-learn, numpy

Other presentation and communication skills

Talks and presentations

2023 **NeurIPS'23**, *poster presentation of [1]*

2022 **ECCV'22**, *oral presentation of [2]*

2022 **Willow, INRIA**, *Ph.D. works presentation*

2022 **IMAGINE, ENPC**, *Ph.D. works presentation*

Work in European research projects

2023–today **CTU Prague**, *EXA4MIND – Extreme Analytics for Mining Data spaces*

Summer schools

ICVSS 2023 International Computer Vision Summer School 2023. Sicily, Italy

Others

Hobbies sports, hiking, reading, friends

Volunteering help in a local nursing home during COVID pandemic, work at poor regions in Czech borderlands (SummerJob)

Work with kids and young adults "Runway": summer camp
"LIFT": formative and animation course

Languages

English Fluent

French Beginner

Czech Native

Full list of publications

[1] Antonin Vobecky, Oriane Siméoni, David Hurych, Spyridon Gidaris, Andrei Bursuc, Patrick Pérez, and Josef Sivic. Pop-3d: Open-vocabulary 3d occupancy prediction from images. In *NeurIPS*, 2023.

[2] Antonin Vobecky, David Hurych, Oriane Siméoni, Spyros Gidaris, Andrei Bursuc, Patrick Pérez, and Josef Sivic. Drive&segment: Unsupervised semantic segmentation of urban scenes via cross-modal distillation. In *Proceedings of the European Conference on Computer Vision (ECCV)*, October 2022.

[3] Antonin Vobecky, David Hurych, Michal Uřičář, Patrick Pérez, and Josef Sivic. Artificial dummies for urban dataset augmentation. In *Proceedings of the AAAI Conference on Artificial Intelligence*, volume 35, 2021.

[4] Oriane Siméoni, Chloé Sekkat, Gilles Puy, Antonin Vobecky, Éloi Zablocki, and Patrick Pérez. Unsupervised object localization: Observing the background to discover objects. In *CVPR*, 2023.

[5] Sophia Sirko-Galouchenko, Alexandre Boulch, Spyros Gidaris, Andrei Bursuc, Antonin Vobecky, Patrick Pérez, and Renaud Marlet. Occfeat: Self-supervised occupancy feature prediction for pretraining bev segmentation networks. *IEEE Conference on Computer Vision and Pattern Recognition (CVPR) Workshops*, 2024.

[6] Spyros Gidaris, Andrei Bursuc, Oriane Siméoni, Antonin Vobecky, Nikos Komodakis, Matthieu Cord, and Patrick Perez. MOCA: Self-supervised representation learning by predicting masked online codebook assignments. *Transactions on Machine Learning Research*, 2024.

[7] Monika Wysoczanska, Antonin Vobecky, Amaia Cardiel, Tomasz Trzcinski, Renaud Marlet, Andrei Bursuc, and Oriane Simeoni. A study of test-time contrastive concepts for open-world, open-vocabulary semantic segmentation. In *ArXiv*, 2024.

[8] Michal Uricar, Ganesh Sistu, Hazem Rashed, Antonin Vobecky, Varun Ravi Kumar, Pavel Krizek, Fabian Burger, and Senthil Yogamani. Let's get dirty: Gan based data augmentation for camera lens soiling detection in autonomous driving. In *WACV*, 2021.

[9] Antonin Vobecky, Michal Uricar, David Hurych, and Radoslav Skoviera. Advanced pedestrian dataset augmentation for autonomous driving. In *Proceedings of the IEEE/CVF International Conference on Computer Vision (ICCV) Workshops*, Oct 2019.

[10] Michal Uricár, Jan Ulicny, Ganesh Sistu, Hazem Rashed, Pavel Krizek, David Hurych, Antonin Vobecky, and Senthil Yogamani. Desoiling dataset: Restoring soiled areas on automotive fisheye cameras. In *Proceedings of the IEEE/CVF International Conference on Computer Vision Workshops*, 2019.

[11] Pavel Jahoda, Antonin Vobecky, Jan Cech, and Jiri Matas. Detecting decision ambiguity from facial images. In *IEEE International Conference on Automatic Face & Gesture Recognition (FG 2018)*, 2018.