Subversive Computing on the Edge: Training Machine Learning in the Wild

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Abstract
This workshop proposal for Media Architecture Biennale 2020 presents a platform for participants to engage with approaches to machine learning on devices at the edge of interaction, situated within the built environment. Collecting data in the urban core of Amsterdam, participants will conceive and train their own models for use with lightweight, embedded and 'tiny' machine learning systems.

Author Keywords
machine learning; edge computing; neural networks; cybernetic urbanism; urban intelligence; participatory platforms

ACM Classification Keywords
F.1.1 Models of Computation: Self-modifying machines (e.g., neural networks); I.2.6 Artificial Intelligence: Learning; I.5.2 Pattern Recognition: Design Methodology

This workshop is positioned within the thematic *Citizens' Digital Rights in the Era of Platform Ecologies: Media architecture that articulates public values and allows citizens to govern through digital platforms, rather than be governed by them.*

As machine learning migrates from the cloud to discrete edge computing devices embedded throughout everyday urban spaces, this workshop aims to pry open the algorithmic 'black box' and introduce participants to the methods, tools and techniques for conceiving, designing, training and implementing their own neural networks within the built environment.

In opposition to opaque, 'deep' artificial intelligence systems built on remote industrial computing infrastructure maintained by experts, lightweight machine learning systems running on edge devices such as microcontrollers, single-board computers and smartphones offer an opportunity for architects, designers, researchers and engaged citizens to actively decide not only how, what and where these systems learn, but also how these systems can be deployed and integrated into the fabric of the city. Revisiting late 20th century notions of cybernetic urbanism, this workshop aims to subvert its propensity toward hegemonic forms of urban governance, opening up the feedback loops of machine learning platforms integrated within urban environments to broader public engagement.

This day-long workshop will expose participants to the current state of the art in machine learning located at the site of interaction, beginning with an accessible overview of machine learning platforms, paradigms, design patterns and training methodologies. Continuing with a roundtable discussion of the implicit subjectivity and explicit intent of identifying and defining classifiers, discriminators and regressions, participants will consider the broader ethical and societal ramifications of collecting and compiling image, sound, location and other sensor-based training datasets in the world at large.

Moving out of the venue space and into the streets of Amsterdam in the afternoon, participants will be issued a personal toolset and targeted prompts to enter the surrounding urban environment and collect data for training a machine learning model. Upon their return, all participants will present and compare their collected training data, and begin training their first prototype models. In parallel, all participant data will also be aggregated to a unified workshop repository, with a view towards producing a series of speculative, collective models that will be shared as an open source resource with MAB20 attendees and the broader public.

Materials

This workshop will focus on approaches to 'tiny' machine learning based on TensorFlow Lite and Tensorflow.js as core technologies, with a special focus on offline and DIY methodologies for training, classification and evaluation using tools such as ml5.js, Tensorboard, RunwayML and Google’s Teachable Machine. The organizers will provide a series of data collection prototypes to participants for their field explorations. Participants are requested to bring their own personal computer, mobile devices and comfortable walking shoes. Workshop documentation, technical information and resulting models will be published to an open-source repository on Github.

Target Audience/Workshop Length

This day-long workshop targets architects, urbanists, interaction designers, artists and researchers of all expertise levels with an interest in machine learning.

Basic knowledge of and proficiency with Javascript and/or Python is recommended. Prior experience with machine learning is not required.

Tentative Schedule

Tuesday, 24 November 2020

10:00-11:00 Introduction to Machine Learning: Conceptual and Mathematical Fundamentals; Neural Networks; Supervised, Unsupervised and Transfer Learning; Software Platforms and Workflows

11:00-12:00 Roundtable Discussion: Ethical and Social Ramifications of Labeled Datasets, Classifiers and Discriminators; Context, Positioning and Prompts for Data Collection

12:00-12:30 Break

12:30-15:00 Field Data Acquisition

15:00-18:00 Data Appraisal, Model Training and Evaluation

18:00-18:30 Debriefing

Deadline for participants' expression of interest

30 May 2020

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