Intelligence-based User Experience

Kal Mos
Vice President, AI & Digital Vehicle
Mercedes-Benz R&D NA

Oct. 10, 2017
UX Intelligence

- Behavior Modeling
- Adaptive UI
- User Identification
- User Sensing
- Action Automation
Case Study
Our New S-Class will always know where you are going!
Enjoy
Behind the Scenes

• Developed in-house at Mercedes-Benz R&D in Silicon Valley
• Validated for 3 years against real-life datasets
• Used >40,000 trips for model validation
• Uses context from multiple vehicle sensors for learning
• More than 18,000 Nvidia Titan X GPU hours for model selection
AI Project Process

- Data Gathering
- Identify Objective
- Data Preparation
- Model Selection
- Model Evaluation
- Model Deployment
Model Selection

- 35 parameters to choose
  - If you assume only 2 possible values per parameter, that’s 34,359,738,368 configurations (~34 Billions)

- ½ hour to evaluate a model configuration...

- If we wanted to try just 10% of the possible models it would take ~195,987 years.
Parameters Optimization

A grid Layout could miss the optimum parameters

- Pick a random value for every parameter, evaluate it
- Keep track of the best one you’ve found so far

- Simple, can be parallelized
- Longer you run it, the better your model is
- Hard to beat if you can evaluate the model in a short amount of time...which is not the case here

Bayesian Optimization

- Secondary learner: learn to predict the performance of a particular set of parameters

- ‘Acquisition function’ defined based on secondary learner
  - expected improvement of parameter values over current best
  - Evaluate model at maxima of the acquisition function

- Only spend time evaluating valuable configurations
  - Could be parallelized: parallel output = batch update to Secondary-learner

https://arxiv.org/abs/1012.2599
Bayesian Optimization

Choose Parameters as Max of Acquisition Function

Evaluate Candidate Parameters (Find the dotted line)

fast

slow

fast

Update Secondary model (Bold line and its uncertainty)

https://arxiv.org/abs/1012.2599
What's next?
Knowledge Aggregation

Gesture + Gaze >> see the world as people do

More environmental sensors >> see the environment as the users do

Web data/ News >> get the same news the users do

Social media >> interact with users the way they interact with each other
A Digital Companion

...a centralized intelligence that:
Perceives, and interacts with, the world in a way that its users do
User can interact with such intelligence like they would with a human co-driver
There’s a building of trust and a relationship between driver and their car
Thank you