



Self-driving vehicle initiative: Overview and dataset

CERSE Meeting 07/08/2024

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The Team



Ram



Alex



Hector



Jim

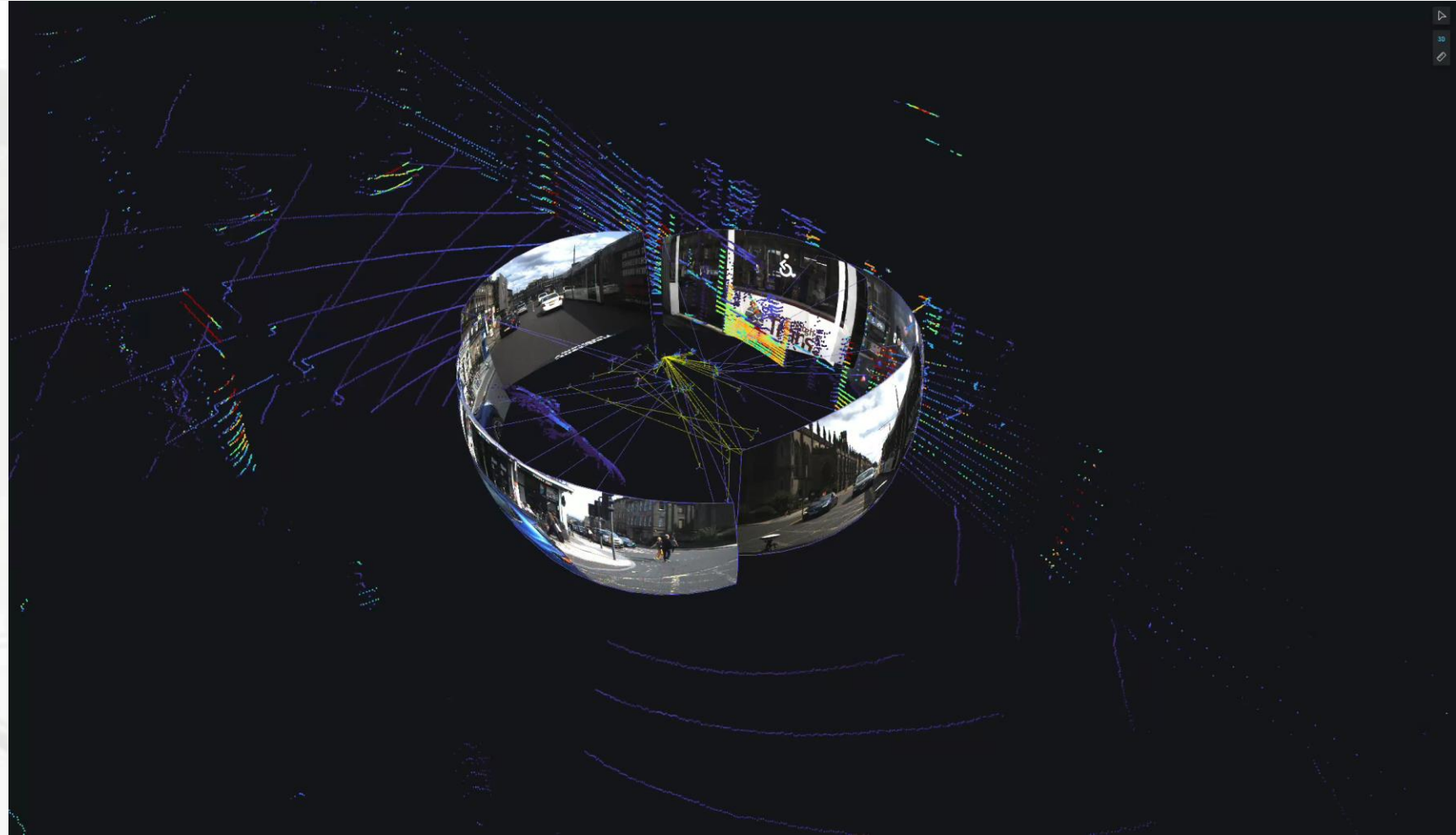


LXO



The Autonomous Driving project

- Edinburgh city dataset
 - Dense
 - Verticality
 - European
 - Top-to-bottom data flow
- Self-driving stack development
- Research domains
 - Perception
 - Prediction
 - Planning
 - Localisation
 - Control
 - Critical safety
 - Ethics
 - ...

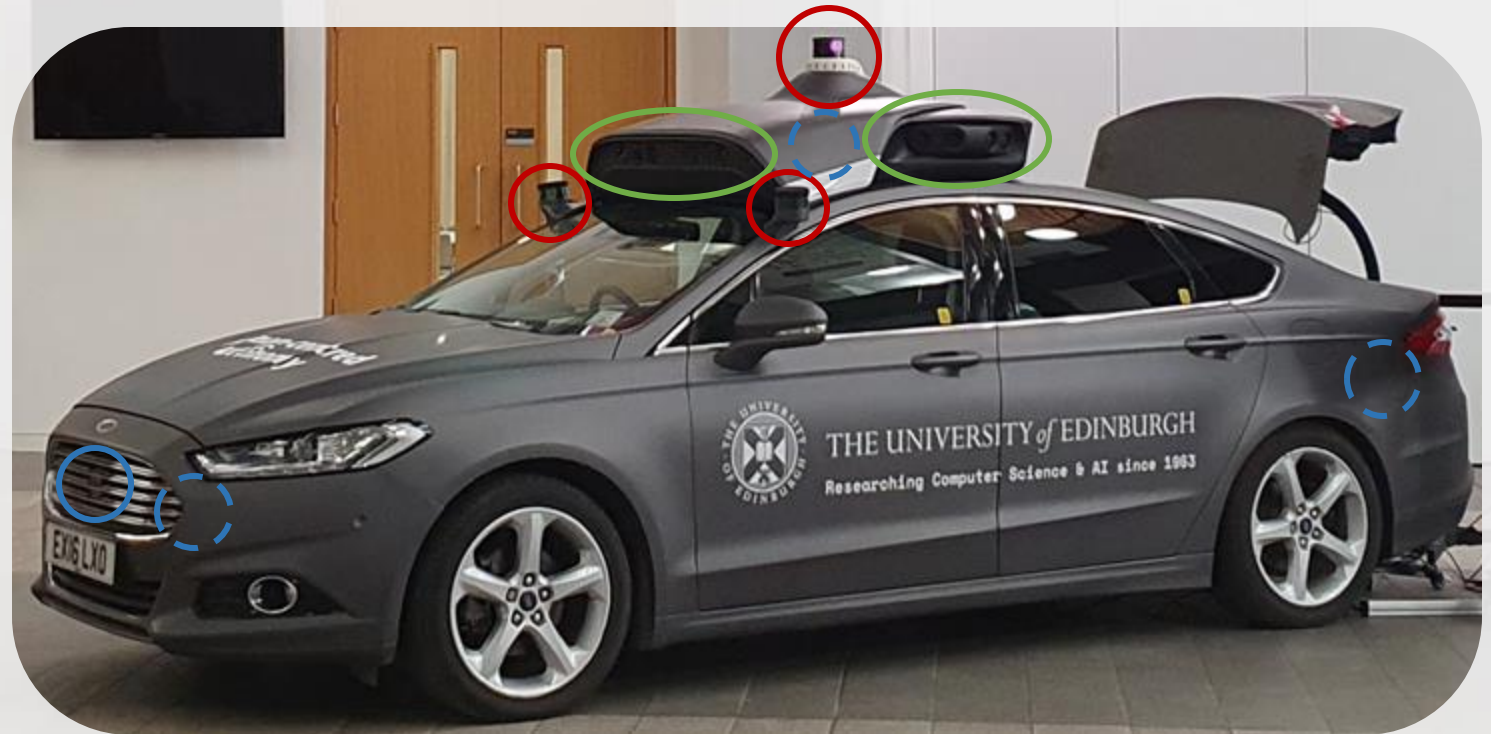


The Hardware



The Hardware

- 16 x **Cameras**:
 - 14 x 5MP Chameleon 3 USB RGB cams w/ HW global shutter
 - 2 x extra forward mounts
 - Potential uses: Tele-zoom, IR
- 3 x **Lidars**:
 - 1 x top Lidar: Ouster OS2-128 channels
 - 2 x side Lidars: Velodyne VLP-16 channels
- 8 x **Radars**:
 - Continental ARS408
- **Localisation**:
 - Novatel PwrPak7D GNSS + RTK
 - Lord GX5-3DM-15 IMU
- **Computing power**:
 - Twin Xeon CPU E5-2690v4 @ 2.6GHz (56 threads)
 - 256 GB RAM
 - 8 x Nvidia GTX 1080Ti GPUs



Hybrid Ford Mondeo – Donated by **FiveAI**/Bosch

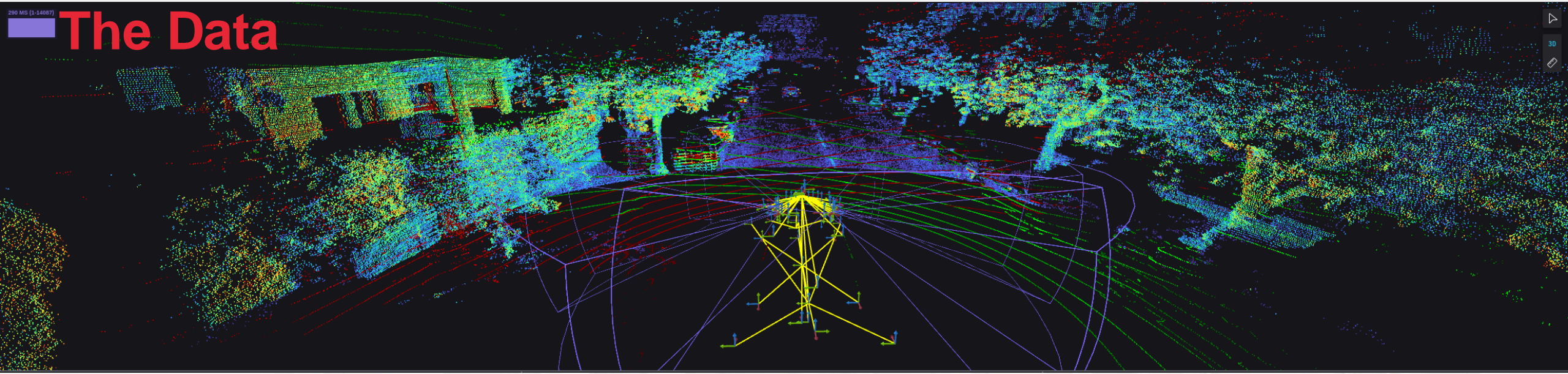


The Software

- **Meta repository:**
https://github.com/ipab-rad/tartan_carpet
- **ROS2** middleware, open-source sensor drivers
- Mostly **C++**, some **Python** for data/viz scripts
- **Docker** container per component in self-driving software stack
- Semantic versioning, CI/CD pipeline
- All our software is open source, available in Github
- Vehicle control via Dataspeed drive-by-wire (ROS2 -> CANbus)
- **Autoware** as base self-driving software stack
<https://autoware.org/>



The Data



Data output:

- 6 x Cameras at 20Hz (Each 1Gb/s)
- 3 x Lidars at 10Hz (Over 1Gb/s for all three)
- Everything else approx. 1Gb/s

About **8Gb of data per second!**

After some tricks (e.g. Region-of-Interest, compression):
Approx. 5GB ROSbag per 20s chunks (Compressed!)

Aim is to record up to 100TB, so approx. **110 hours of data**

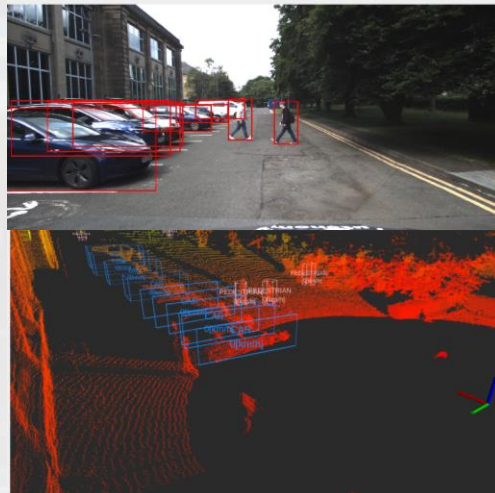
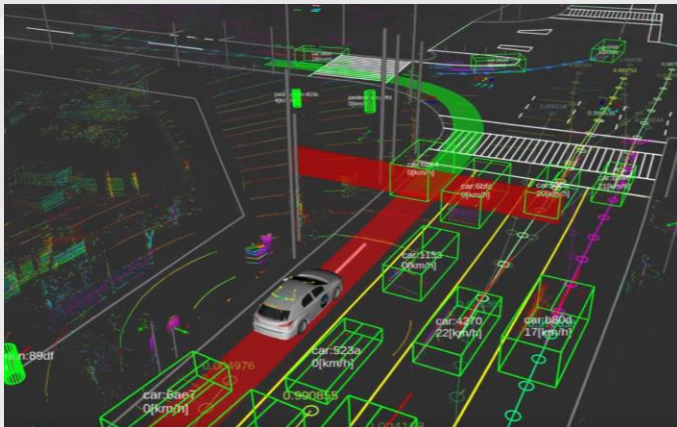
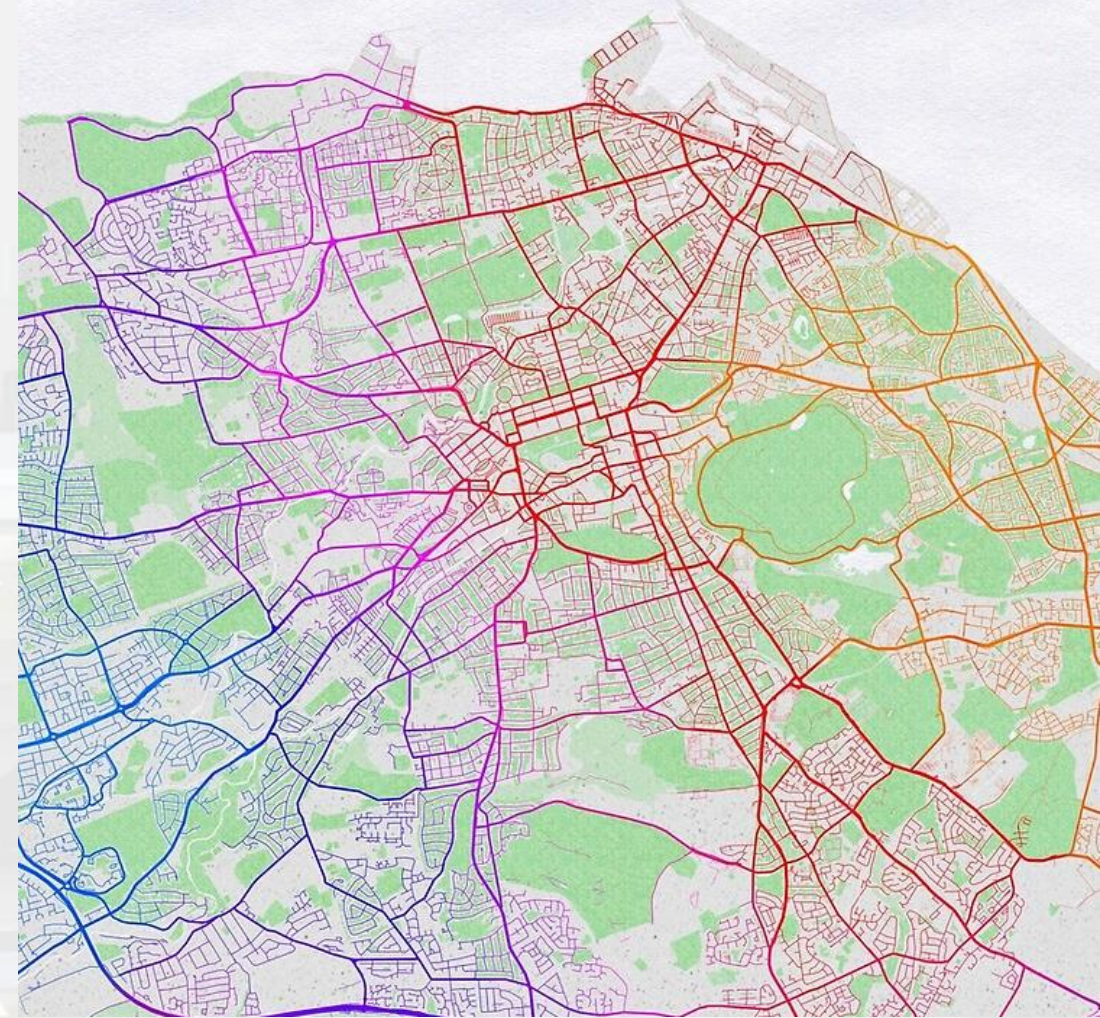
Data format:

- **mcap** format (Open source container file format for multimodal log data) <https://mcap.dev>
- "raw" camera (Bayer) + rectified (calibrated) images
- Lidar 3D pointclouds
- 100Hz GPS + RTK corrected pose (up to 2cm accuracy!)
- Driver input (e.g. pedals + steering) from drive-by-wire kit
- In discussion:
 - In-car dash-cam footage
 - Radar detections



The plan

- Data collection around Edinburgh city and surrounding areas
- EIDF collaboration for data storage and distribution
- Dataset paper publication and public research access
- Data analysis with MSc, PhD students and other interested parties
- Dataset challenges, benchmarks, support, dataset updates
- Development of self-driving stack technologies and trials
- Get involved!



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