



# Smart Vehicular System

## Lab 1

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- Open source simulator designed for research on driving scenarios
- Realistic virtual world to test vehicles with controlled weather, lighting, and traffic
- Supports training, testing, and validation while reducing costs and risks compared to on road experiments



- Safe experimentation with complex scenarios without endangering people or hardware
- Open source platform with code and protocols available on GitHub
- Open digital assets (urban layouts, buildings, vehicles) available for reuse
- Multi sensor setup with cameras, LiDAR, radar, GNSS, and other modalities for perception and planning pipelines



- Widely adopted by industry and academia with many published baselines and example projects
- Active community with extensive documentation and shared troubleshooting resources
- Native ROS 2 interface and ROS bridge for ROS 1 and ROS 2 integration



Area	Requirement
Supported systems	Windows or Linux (64 bit)
GPU	Dedicated GPU with at least 6 GB VRAM, 8 GB recommended
Disk space	About 20 GB for the packaged simulator
Python	Python 3 with pip 20.3+; pygame and numpy for quick start
Network	Two TCP ports available, 2000 and 2001 by default



- Setup can be demanding and benefits from familiarity with Python and simulator configuration
- Simulation is an approximation of reality, so traffic and pedestrian behavior can differ from real urban dynamics
- Official support focuses on Linux and Windows, with limited support for other platforms and architectures



Follow the official quick start and installation guide, then download the simulator binaries.

- GitHub releases: <https://github.com/carla-simulator/carla/releases>
- Campus file share via SMB using Windows Explorer

## **SMB access from Windows Explorer**

Type the following path in the Explorer address bar:

`\\137.204.72.11`

Use these credentials when prompted:

- Username `smbauser`
- Password `simcar`



- After extracting the package, start CARLA via the graphical launcher or the server executable
- Typical workflow: download CARLA, set up the Python client, then run the example scripts once the server is running
- Keep the default networking ports available and ensure the firewall does not block the connection



Use a Python environment manager (conda or venv) to keep dependencies isolated.

## Create a conda environment

```
conda create -n carla-env python=3.7
conda activate carla-env
python --version # Python 3.7.x
```

## Install dependencies and the CARLA Python package

```
pip install -r PythonAPI/examples/requirements.txt
pip install carla
```



**Prerequisite: CARLA server must be running.**

```
cd Code/examples  
python tutorial.py
```

- Connects to the server and spawns a vehicle
- Enables autopilot and attaches a depth camera
- Saves images in `_out/`



**Prerequisite: CARLA server must be running.**

```
cd Code/examples  
python manual_control.py
```

- Keyboard driving with HUD (demo live)
- Main keys: WASD, P (autopilot), H (help)



**Prerequisite: CARLA server must be running.**

```
cd Code/examples  
python dynamic_weather.py
```

- Changes sun position and weather over time
- Clear visual feedback for lighting and rain



**Prerequisite: CARLA server must be running.**

```
cd Code/examples  
python generate_traffic.py
```

- Spawns vehicles and pedestrians automatically
- Options: `--number-of-vehicles` and `--number-of-walkers`



```
import carla

# Connect to the server
client = carla.Client('localhost', 2000)
world = client.get_world()
```



- ① A Dosovitskiy, G Ros, F Codevilla, A Lopez, V Koltun. CARLA: An Open Urban Driving Simulator. Proceedings of the First Annual Conference on Robot Learning, 2017.
- ② CARLA documentation, version 0.9.15. <https://carla.readthedocs.io/en/0.9.15/>
- ③ CARLA GitHub repository. <https://github.com/carla-simulator/carla>
- ④ ROS website. <https://www.ros.org>

# Thank you for your attention

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