**🧭 Phase-by-Phase Roadmap: SUMO Network Reconstruction (April 2025 Version)**

**📁 Script Folder:**  
D:\PhD\codingPractices\progress-report-dec-2024\scripts\april\_2025\  
**📁 SUMO Input Output Folder:**  
D:\PhD\codingPractices\progress-report-dec-2024\sumo\inputs\april\_2025\_swiss\

**✅ Phase 1: Extract Railway Nodes and Edges**

1. **Input:** swissTNE\_Base\_20240507.gpkg (already in your data)
2. **Output:** rail\_nodes.csv, rail\_edges.csv
3. **Goal:** Extract all Swiss rail nodes and edges with correct coordinate projection (EPSG:2056)

**📄 Script 1:** extract\_nodes\_and\_edges.py  
Purpose: Load the SwissTNE GeoPackage, filter rail data, extract nodes and edges, and save to CSV.

**✅ Phase 2: Generate SUMO Node File**

1. **Input:** rail\_nodes.csv
2. **Output:** april\_2025\_swiss.nod.xml
3. **Goal:** Write all nodes with SUMO-compatible IDs and coordinate system.

**📄 Script 2:** write\_sumo\_nodes.py  
Purpose: Convert the rail node DataFrame into a .nod.xml file.

**✅ Phase 3: Generate SUMO Edge File**

1. **Input:** rail\_edges.csv
2. **Output:** april\_2025\_swiss.edg.xml
3. **Goal:** Define edges using connected node IDs, giving human-friendly edge names.

**📄 Script 3:** write\_sumo\_edges.py  
Purpose: Convert the rail edge data into a .edg.xml file with naming heuristics (e.g. origin-destination edge names).

**✅ Phase 4: Generate Empty Connection File**

1. **Input:** ---
2. **Output:** april\_2025\_swiss.con.xml
3. **Goal:** Create a placeholder empty connection file (no switches/turns assumed yet)

**📄 Script 4:** write\_empty\_connections.py  
Purpose: Write a valid but empty SUMO .con.xml file to satisfy netconvert.

**✅ Phase 5: Create Network Config File and Run netconvert**

1. **Input:** All three XMLs above
2. **Output:** april\_2025\_swiss.net.xml
3. **Goal:** Generate the complete .net.xml using a Python script that invokes netconvert.

**📄 Script 5:** generate\_net\_with\_netconvert.py  
Purpose: Generate the netconvert command and execute it from Python using subprocess.

**✅ Phase 6: Validate the Network**

1. **Optional Manual Step:** Open in SUMO-GUI
2. **Optional:** Provide a summary script that prints number of nodes, edges, segments, and a sample list.

**📄 Script 6:** summarize\_network\_contents.py  
Purpose: Post-generation inspection of the network file.