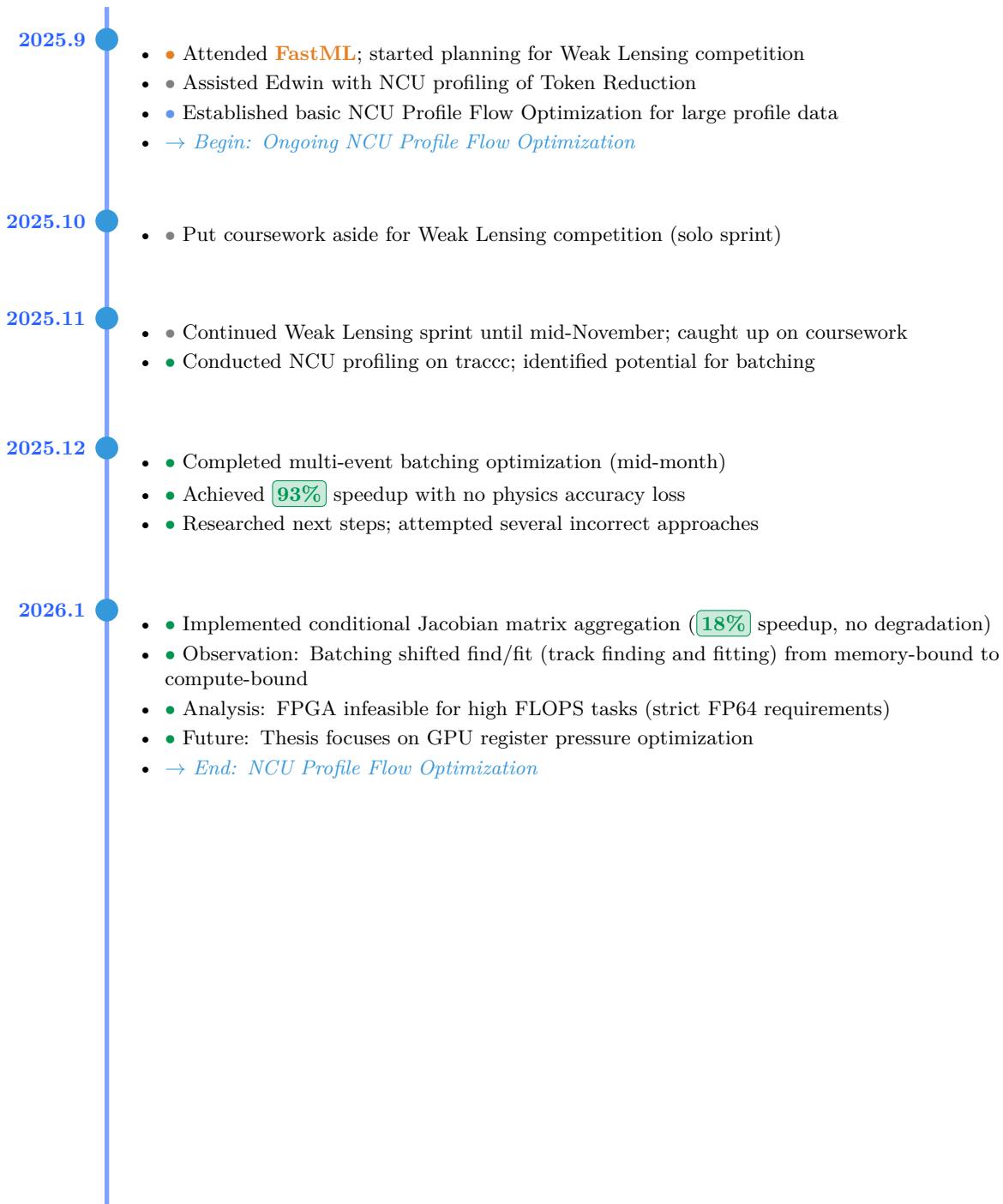


# GPU Track Reconstruction Optimization Timeline

November 2024 – January 2026

- 
- 2024.11–2025.1
    - Established the traccc (GPU track reconstruction) environment
  - 2025.2–2025.3
    - Studied traccc code and algorithms (over 70,000 lines)
    - Analyzed next steps and reported to the European team
    - Revised the manuscript for YunChen's paper
  - 2025.4
    - Set up the Nvidia Nsight Systems (profiler) environment
    - Profiled traccc to identify bottlenecks
    - Created figures for YunChen's paper
  - 2025.5
    - Analyzed bottlenecks; attempted code modifications and debugging
    - Split the fit kernel, increasing throughput by **10%**
    - Assisted YunChen with the **VLSICAD** (conference) submission
  - 2025.6
    - Replaced Kalman gain matrix (track fitting computation) operations with INT8 MLP
    - Achieved **186%** speedup but observed **physics accuracy degradation**
    - Reported results to the European team
    - Assisted YunChen with the **TJCAS** (conference) submission
    - Attempted Nsight Compute (kernel profiler) setup (severe environmental issues)
  - 2025.7
    - Prepared slides & scripts (EN/CN) for YunChen's **VLSICAD 2025** oral
    - Prepared slides & scripts for the **TJCAS** oral presentation
    - Successfully established the Nvidia Nsight Compute (NCU) environment
  - 2025.8
    - Created posters for **TJCAS** and **FastML** (workshop)
    - Attended **VLSICAD** and **TJCAS**

— *Continued on next page* —



### Legend

• Optimization/Analysis    • Conference/Paper    • Tooling/Setup    • Collaboration/Other

**Green Badge** = Performance Achievement    **Red Text** = Accuracy Concern    **Blue Sidebar** = NCU Flow Optimization Period

### Key Performance Achievements

<b>10%</b>	Fit kernel splitting	2025.5
<b>186%</b>	INT8 MLP replacement (with accuracy trade-off)	2025.6
<b>93%</b>	Multi-event batching (no accuracy loss)	2025.12
<b>18%</b>	Conditional Jacobian aggregation (no accuracy loss)	2026.1