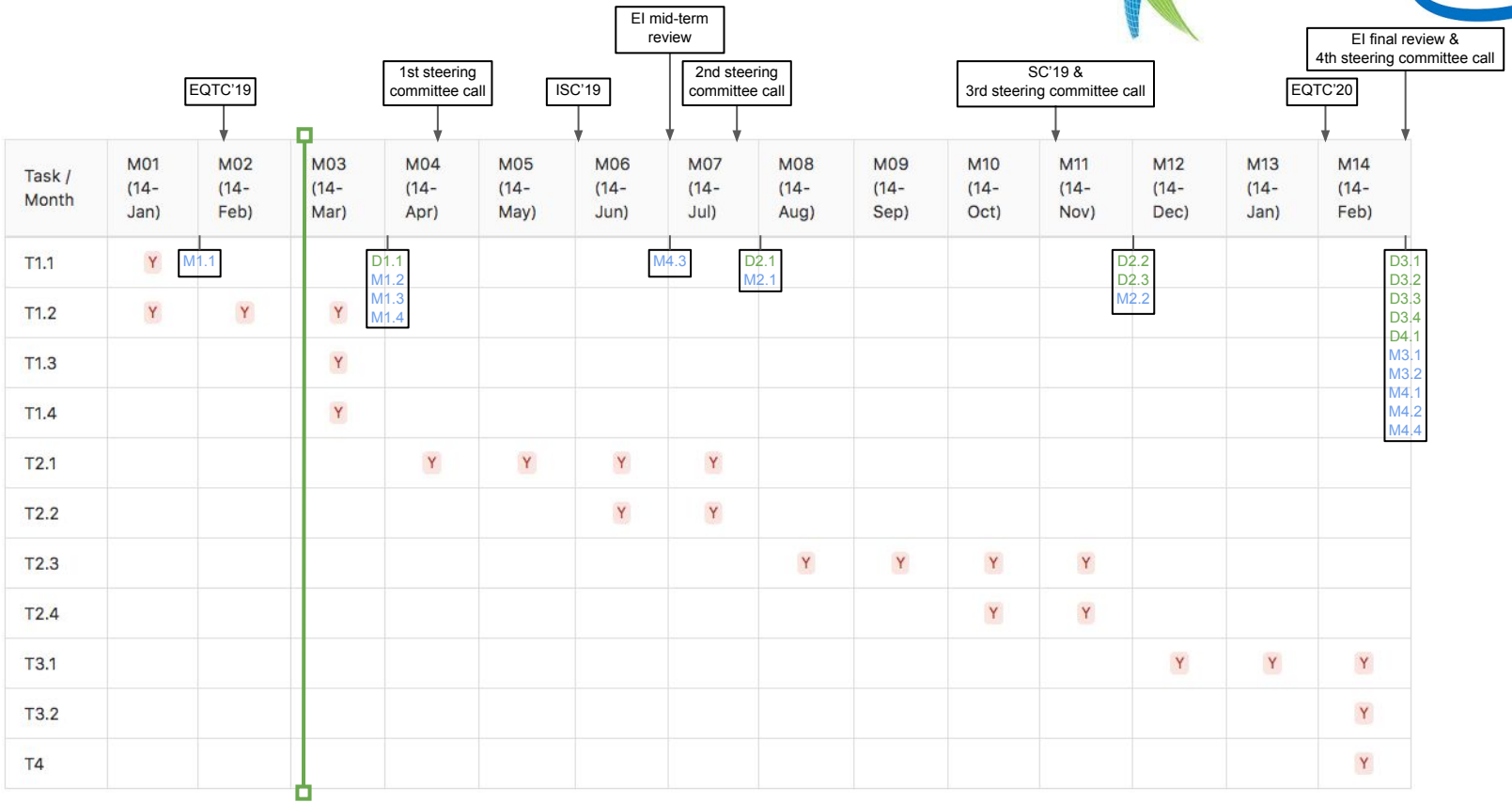
Quantum Natural Language Processing

All-hands meeting
15-March-2019

ICHEC, Dublin

Project timeline



ICHEC-Intel QNLP | **Short Status Update** | **Date: 25-Feb-2019**

Status of prior 3 weeks

- Quantum nearest neighbour algorithm
  - Surveyed four versions
  - Implementation challenges in two versions
    - Oracle operations required
    - Extension to multi-dimensional vector space is not straightforward
  - Third & fourth versions for binary vectors; extensible for meaning space vectors (real)
  - Test implementations of third/fourth version
- Preparation of representative corpus
  - 10x-100x words; tagging; meaning space analysis
- qHiPSTER on Kay
  - qHiPSTER_Installation_and_Usage_Issues.md
  - Working for smaller problem sizes with AVX512
- ISC 2019
  - Draft of project poster submitted on 20-Feb
  - Liaised with LRZ and Intel DE for tutorial

Plans for next 3 weeks

- Quantum nearest neighbour algorithm
  - Preliminary implementation for binary vectors
  - Formalise mapping for meaning space vectors
    - Pre-computation required for state initialisation
    - Gates/operators to be implemented in qHiPSTER
    - Quantum circuit to be implemented
- CSC sentence similarity algorithm
  - Define mapping NLP operations to Dirac notations, Q operations
- ISC 2019
  - Presentation/presence at Intel Booth
    - ICHEC to work with FB
- SC 2019
  - Proposal for tutorial session (16-Apr)
    - ICHEC will circulate details mid-March
  - Paper submission (02-Apr, 10-Apr)
    - TBD

High-level dashboard

- Project members
  - Intel -- FB, JK, BQ
  - ICHEC -- MD, VK, LOR, PW
- Deliverables/Milestones
  - M1.1 (M01; 14-Feb)
  - D1.1 (M03; 15-Apr)
  - M1.2, M1.3, M1.4 (M03)

Issues / Bottlenecks

- qHiPSTER scalability using BigMPI
  - MPI communication error for larger problem sizes; Details shared in qHiPSTER_Installation_and_Usage_Issues.md in repository

Action needed from ILE staff

- Feedback on qHiPSTER scalability issues with BigMPI

ICHEC-Intel QNLP | **Short Status Update** | **Date: 15-Mar-2019**

Status of prior 3 weeks

- Quantum nearest neighbour algorithm
  - Implemented preliminary binary vector problem
  - Formalised mapping for meaning space vectors
    - Implemented state initialisation pre-computation
    - Gates/operators implemented in qHiPSTER
    - Quantum circuit to be implemented
- CSC sentence similarity algorithm
  - Definition of mapping NLP operations to Dirac notations, Q operations is ongoing
- ISC 2019
  - Presentation/presence at Intel Booth
    - ICHEC sent request to FB (14-Mar)
- SC 2019
  - Proposal for tutorial session (16-Apr)
    - ICHEC will circulate details mid-March
  - Paper submission (02-Apr, 10-Apr)
    - Not to pursue; too early for a full research paper
- Press Release: Silicon Republic / Tech Central / Intel Press room

Plans for next 3 weeks

- Quantum nearest neighbour algorithm
  - Improve implementation for binary vectors
    - Explore reducing qubits needed for encoding
    - Experiment with variations of distance algorithms
  - Implement binary method for corpus database
    - Mapping strategy of corpus to binary vector
- CSC sentence similarity algorithm
  - Define mapping NLP operations to Dirac notations, Q operations
  - Meeting with B. Coecke March 29 (DisCo author)
- ISC 2019
  - Presentation/presence at Intel Booth
    - ICHEC to work with FB
- SC 2019
  - Proposal for tutorial session (16-Apr)
    - ICHEC preparing outline of content
    - Discuss proposal on 08-Apr (all-hands)

High-level dashboard

- Project members
  - Intel -- FB, JK, BQ
  - ICHEC -- MD, VK, LOR, PW
- Deliverables/Milestones
  - M1.1 (M01; 14-Feb)
  - D1.1 (M03; 15-Apr)
  - M1.2, M1.3, M1.4 (M03)

Issues / Bottlenecks

- qHiPSTER scalability
  - BigMPI deprecated from qHiPSTER
  - Use standard Intel MPI; allows for ~2^27 states

Action needed from ILE staff

- HPCS 19 poster approval
- ISC 2019 dissemination options at Intel Booth