Fast Access for Massive Machine Type Communications in Cell-free Massive MIMO Systems

A Data Management Plan created using DMPTuuli

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Template: Academy of Finland data management plan guidelines

Project abstract:

Research underway for what is happening after 5G. One key technologies used in the standardization is MIMO and also massive MIMO. Now, a novel concept, cell-free massive MIMO (cell-free mMIMO) which is a hybrid model which combines the features of distributed MIMO and mMIMO is considered to play a significant role in beyond 5G and even considered to form the backbone for 6G as understood in certain scenarios. Thus here we propose to investigate cell-free mMIMO further and consider more realistic cases. Apart from traditional multi-user system with regular quality of service metrics, as a core part of the proposal is to consider massive machine type communications. Current wireless systems are designed with the goal of providing high data rates for a small group of human type users. However, with the introduction of the Internet-of-things (IoT), at each cell, tens of thousands of devices will need to transmit small data packets. These packets are often transmitted from IoT devices to the base stations, so most of the traffic will be in the uplink. Moreover, various IoT verticals have applications that require different quality-of-service (QoS) requirements in terms of latency, reliability, etc. Hence, this type of machine-type-communications (MTC) will pose new challenges to the wireless communication systems that are different compared to human type communications. So, in a nutshell, current wireless systems fail to provide connectivity for a massive number of IoT devices that want to transmit small data packets in the uplink direction and have different QoS requirements. In this proposal, we aim to solve this problem by using data-driven approaches and advanced machine learning algorithms in the context of cell-free massive MIMO. The data gathered from IoT transmission can give insights on the transmission pattern and QoS requirements of each IoT device. Hence, data analytics at the edge of the network can be used for source traffic prediction purposes.

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Copyright information:

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1. General description of data

1.1 What kinds of data is your research based on? What data will be collected, produced or reused? What file formats will the data be in? Also give a rough estimate of the size of the data produced or collected?

Some of the data will be computer generated and therefore simulation data. The other would be collected from sensors.

1.2 How will the consistency and quality of data be controlled?

The data will be verified against published / previously collected data as well as in the literature to the extent possible.

2. Ethical and legal compliance

2.1 What ethical issues are related to your data management, for example, in handling sensitive data, protecting the identity of participants, or gaining consent for data sharing?

Information collected can be released without privacy restrictions because it does not constitute private information about identified human subjects or any such complications.

2.2 How will data ownership, copyright and IPR issues be managed? Are there any copyrights, licences or other restrictions that prevent you from using or sharing the data?

The research project will not use any data which is covered by the Copyright, Designs and Patents or any other similar legislation. Every research partner will sign a contract agreeing that data arising from research projects will be made openly available where possible. The intellectual property of the data generated will remain with researchers.

3. Documentation and metadata

3.1 How will you document your data to make them findable, accessible, interoperable and reusable for you and others? What kinds of metadata standards, README files or other documentation will you use to help others understand and use your data?

Data will be available and cited in publications. Researchers will be able to contact the PI for access to data.

4. Storage and backup during the research project

4.1 Where will your data be stored, and how will they be backed up?

The data will be stored in CWC computer servers, our project will ensure that the research data are migrated to new formats, platforms, and storage media as required by good practice.

4.2 Who will be responsible for controlling access to your data, and how will secured access be controlled?

During data analysis, the data will be accessible only by certified members of the project team. The research project will remove any direct identifiers (if any) in the data before depositing with [CWC server].

5. Opening, publishing and archiving the data after the research project

5.1 What part of the data can be made openly available or published? Where and when will the data, or their metadata, be made available?

All data will be available upon contacting the project team.

5.2 Where will data with long-term value be archived, and for how long?

The research data from this project will be deposited with [CWC server] to ensure that the research community has long-term access to the data. By depositing data with [CWC server], our project will ensure that the research data are migrated to new formats, platforms, and storage media as required by good practice. The [CWC server] will generate DOI's [=persistent identifier] enabling access to the data sets via persistent links.

6. Data management responsibilities and resources

6.1. Who will be responsible for specific tasks of data management during the research project life cycle? Estimate also the resources (e.g. financial, time and effort) required for data management.

Research team will be responsible for data management.
Staff time has been allocated in the proposed budget to cover the costs of preparing data and documentation for archiving. The CWC server can be used without cost.