Asymptotic Analysis for Multi-user Massive MIMO Cellular Systems

Supervisor: Engy Aly Maher

Project Overview:

Cooperative communication has been prominently studied due to the enormous increase in the number of wireless devices and services which makes the co-existence of device to device (D2D) and cellular communications a crucial demand. In a cellular network, a lot of standby devices which are equipped with D2D capabilities are located at a close proximity to each other.

In this project, we implement a hybrid cellular-D2D scheme in order to incorporate the advantages of D2D communication between stand-by users and cellular active users in terms of the cellular data rate enhancement. The system model is evaluated by the deployment of a massive antenna array at the BS, the stand-by and active cellular users in order to realize a distributed multiple-input-multiple-output (MIMO) system.
We will apply four power scaling schemes for the proposed model and the corresponding asymptotic spectral efficiency (SE) is derived and validated by numerical results.

Output: The performance of the system model is evaluated in terms of spectral efficiency comparing the four power scaling schemes.

Eligible Departments:

Electronics	-
Communications	**X**
Networking	-

Software:

Matlab

Power Allocation for NOMA over 5G Mobile Wireless Networks

Supervisor: Engy Aly Maher

Project Overview:

Power-domain non-orthogonal multiple access (NOMA) has been widely considered as a promising candidate for the next generation of wireless communication systems. When compared with conventional orthogonal multiple access (OMA) schemes, NOMA achieves higher spectral efficiency (SE). Recently, multiple-input multiple-output (MIMO) has also been integrated into NOMA to further enhance the SE.

In this project, power allocation (PA) is investigated for a multiple-input multiple-output non-orthogonal multiple access system with multiple users in a cluster. Our proposed model aims to maximize the sum-rate of the users with the best-effort while guaranteeing their minimum required target rates.

Output: The performance of the system model is evaluated in terms of sum rate and comparing it with the conventional OMA system model.

Eligible Departments:

Electronics	-
Communications	**X**
Networking	-

Software:

Matlab

Resource Allocation techniques in NOMA with single user MIMO

Supervisor: Engy Aly Maher

Project Overview:

Non-orthogonal multiple access (NOMA) enables a balanced trade-off between spectral efficiency and user fairness, being recognized as a promising multiple access technique for the fifth generation (5G) networks. The performance of a NOMA system is highly dependent on both user pairing (UP) and power allocation (PA). These are usually referred to as resource allocation (RA), which represents the central theme of this project.

In this project, different RA schemes are investigated for a multiple-input multiple-output non-orthogonal multiple access system with multiple users in a cluster. Our proposed model aims to maximize the sum-rate of the users with the best-effort while guaranteeing their minimum required target rates.

Output: The performance of the system model is evaluated in terms of sum rate and comparing it with the conventional OMA system model.

Eligible Departments:

Electronics	-
Communications	**X**
Networking	-

Software:

Matlab

Resource Allocation in THz UAV-based Heterogeneous Networks

Supervisor: Engy Aly Maher

Project Overview:

Recently, the deployment of unmanned aerial vehicles (UAVs) in the wireless networks has gained attention to achieve a better quality of service (QoS) for the mobile nodes.

In this project, we propose a resource allocation scheme in the UAV assisted heterogeneous networks (UAV-HetNets) where both UAV and terrestrial networks are efficiently utilized to meet the QoS requirements of the mobile nodes. This system operates in the terahertz (THz) band

Output: The performance of the system model is evaluated via numerical results to study the effect of the proposed scheme and how it contributes to perform in the UAV-based HetNets.

Eligible Departments:

Electronics	-
Communications	**X**
Networking	**X**

Software:

Matlab