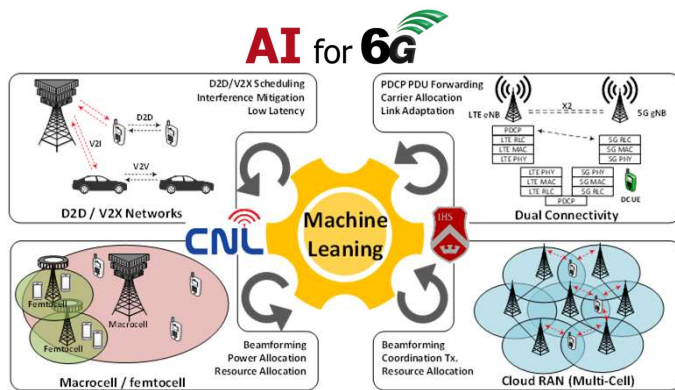


통신네트워크 연구실 (CNL)

Communications and Networking Lab

<http://cnl.sogang.ac.kr>



Wireless AI

Wireless Connectivity

Lab Information



- 지도교수: **소재우 (Prof. Jaewoo So)**
 - 교수실: R관 709A호
 - 이메일: jwso@sogang.ac.kr



- 연구실: **통신네트워크 연구실 (CNL)**
 - 설립: 2008년 9월
 - 위치: R관 709호
 - 홈페이지: <http://cnl.sogang.ac.kr>

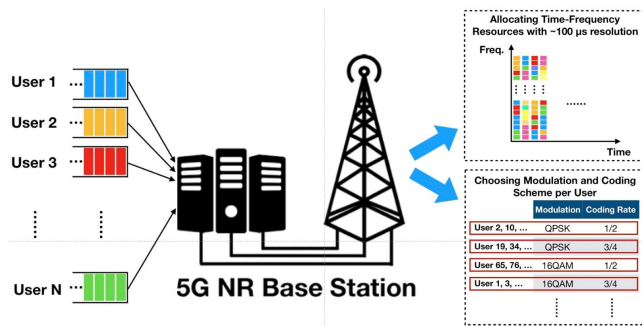


- 연구 분야:
5G/6G, Connected Car, IoT 에서
Wireless AI (무선 인공지능)과 **Wireless Connectivity** (무선 접속)을 연구합니다.

Research Areas – Wireless Connectivity (1/2)

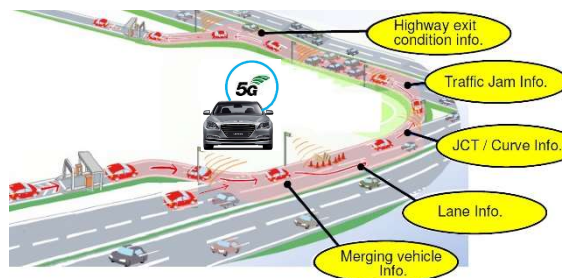
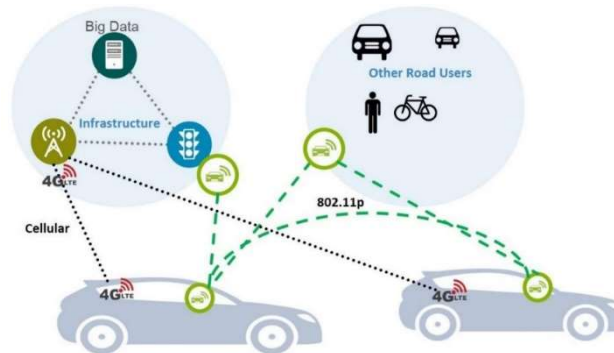


- 5G/6G**로 “더욱 빠르고(eMBB), 모든 기기들을(massive), 지연없이(Low latency)” 무선으로 연결하는 **Wireless Connectivity** 기술을 연구합니다.



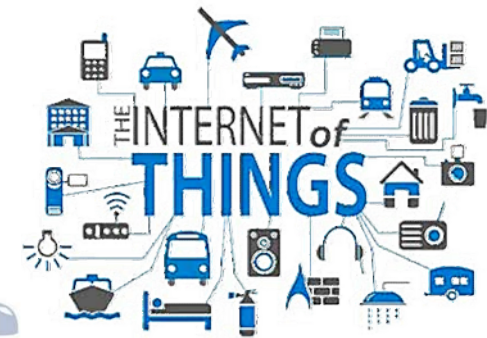
5G/6G 통신

(Radio access technologies)



차량통신

(V2X: Vehicle-to-Everything)



Massive Connectivity

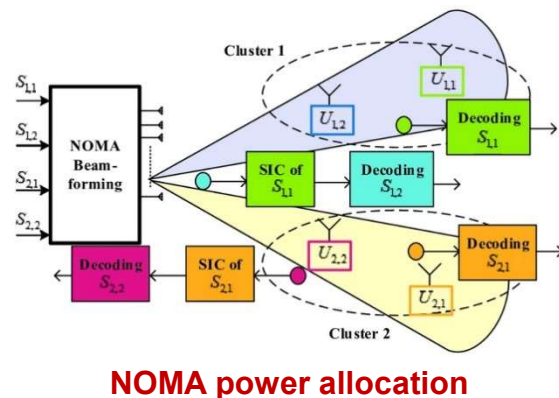
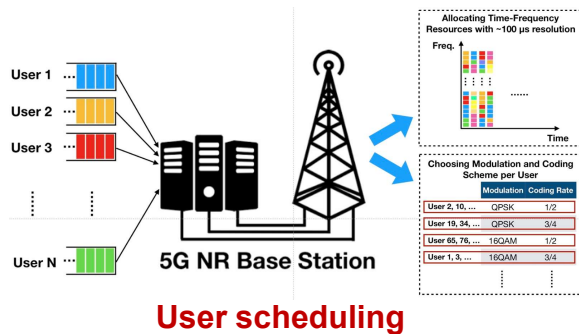


IoT 통신

(Metering, Tracking, Monitoring, Safety)

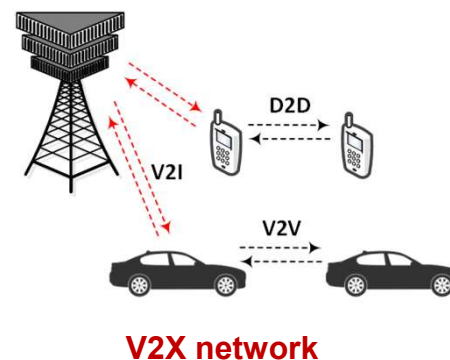
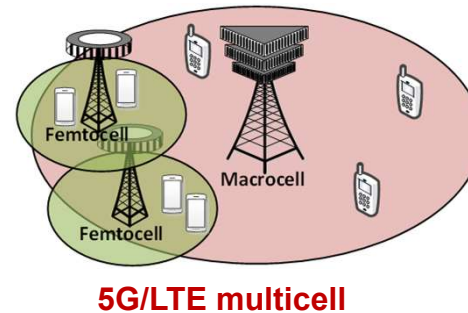
Resource Allocation

- User selection
- Power allocation
- Resource allocation



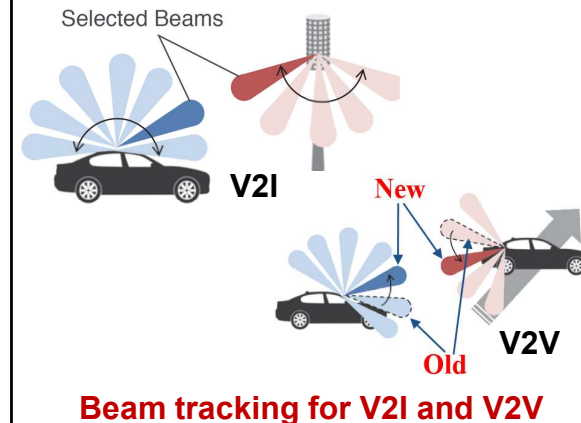
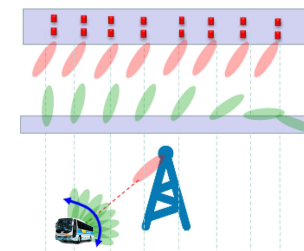
Interference Mitigation

- Interference alignment in C-RAN and D2D
- Coexistence of BT and Wi-Fi



Beam Management

- Beam sweeping
- Beam tracking
- Beam CSI reporting



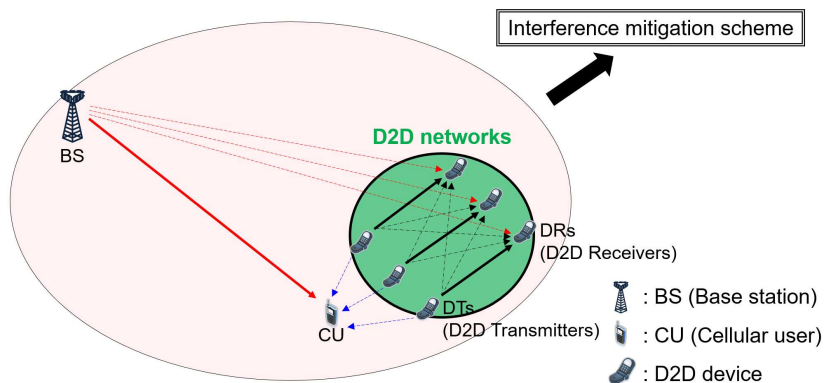
Conventional Approach

- Mathematical approach
- Computer simulation approach

Example:

- Max. sum capacity of D2D s.t. ...

$$\underbrace{\max_{\mathbf{v}_k, \mathbf{u}_k^H, d_k, \mathbf{p}_k}}_{\substack{\text{Inter-system interference} \\ \text{Inter-stream interference}}} \sum_{l=1}^{d_k} \log_2 \left(1 + \frac{\frac{p_{k,k}}{d_k} \|\mathbf{u}_{k,l}^H \mathbf{H}_{k,k} \mathbf{v}_{k,l}\|_F^2}{\frac{p_{k,0}}{d_0} \|\mathbf{u}_{k,l}^H \mathbf{H}_{k,0} \mathbf{V}_0\|_F^2 + \sum_{m=1, m \neq l}^{d_k} \frac{p_{k,k}}{d_k} \|\mathbf{u}_{k,l}^H \mathbf{H}_{k,k} \mathbf{v}_{k,m}\|_F^2 + n_k}} \right)$$



AI Approach

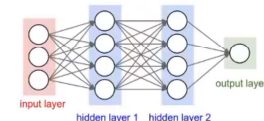


"Machine Learning will greatly change the way of communication system design in the near future."

CAN MACHINE LEARNING TRUMP THEORY IN COMMUNICATION SYSTEM DESIGN?

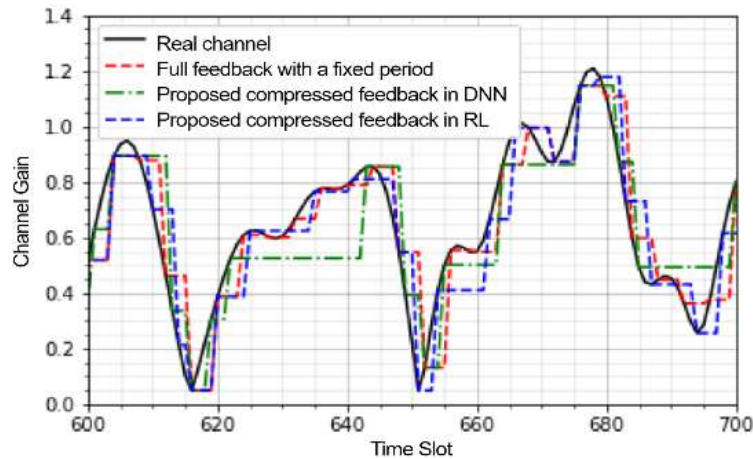
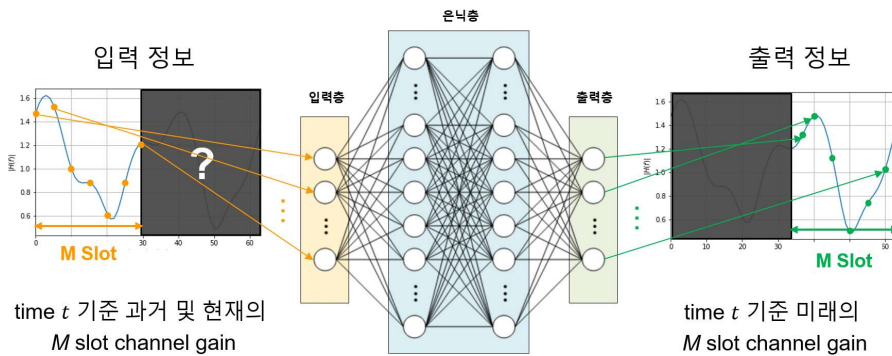


Andrea Goldsmith
Stanford University



Research Areas – Wireless AI (2/2)

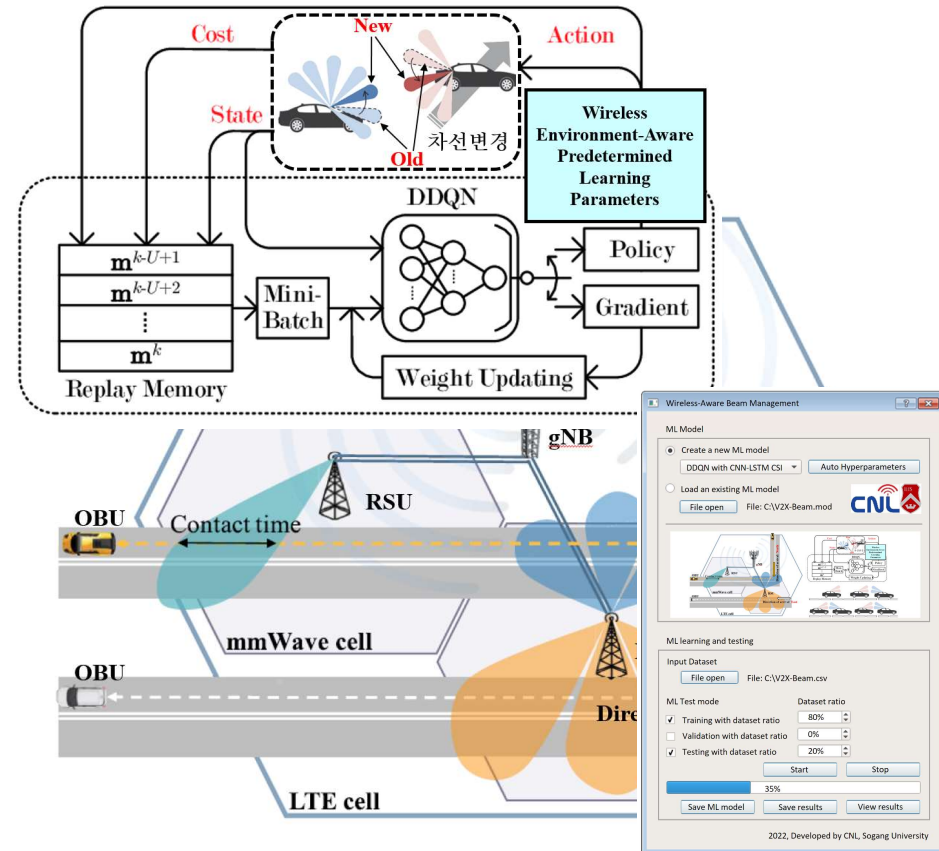
AI-based CSI Feedback



AI-based CSI feedback

AI-based Resource Allocation

AI-based Beam Management



AI-based Joint Resource/Beam Management

Who should Apply ?



- **Who** should apply ?
 - “LTE/5G/6G 이동통신” 에 관심이 있는 학생
 - “통신 교과목” 에 흥미가 있는 학생
 - “수학” 또는 “AI” 또는 “프로그래밍” 에 관심이 있는 학생
- **Remarks** to prospective students
 - “학점” 보다 “**성실** (열정과 근면)” 이 중요합니다.

▪ 졸업후 진로

- 스마트폰, 기지국
- 이동통신 서비스 회사
- 자동차 회사



- **홈페이지**를 방문하고, 교수님께 **이메일**로 상담 요청하세요.



<http://cnl.sogang.ac.kr>



jwso@sogang.ac.kr

Good Choice!

