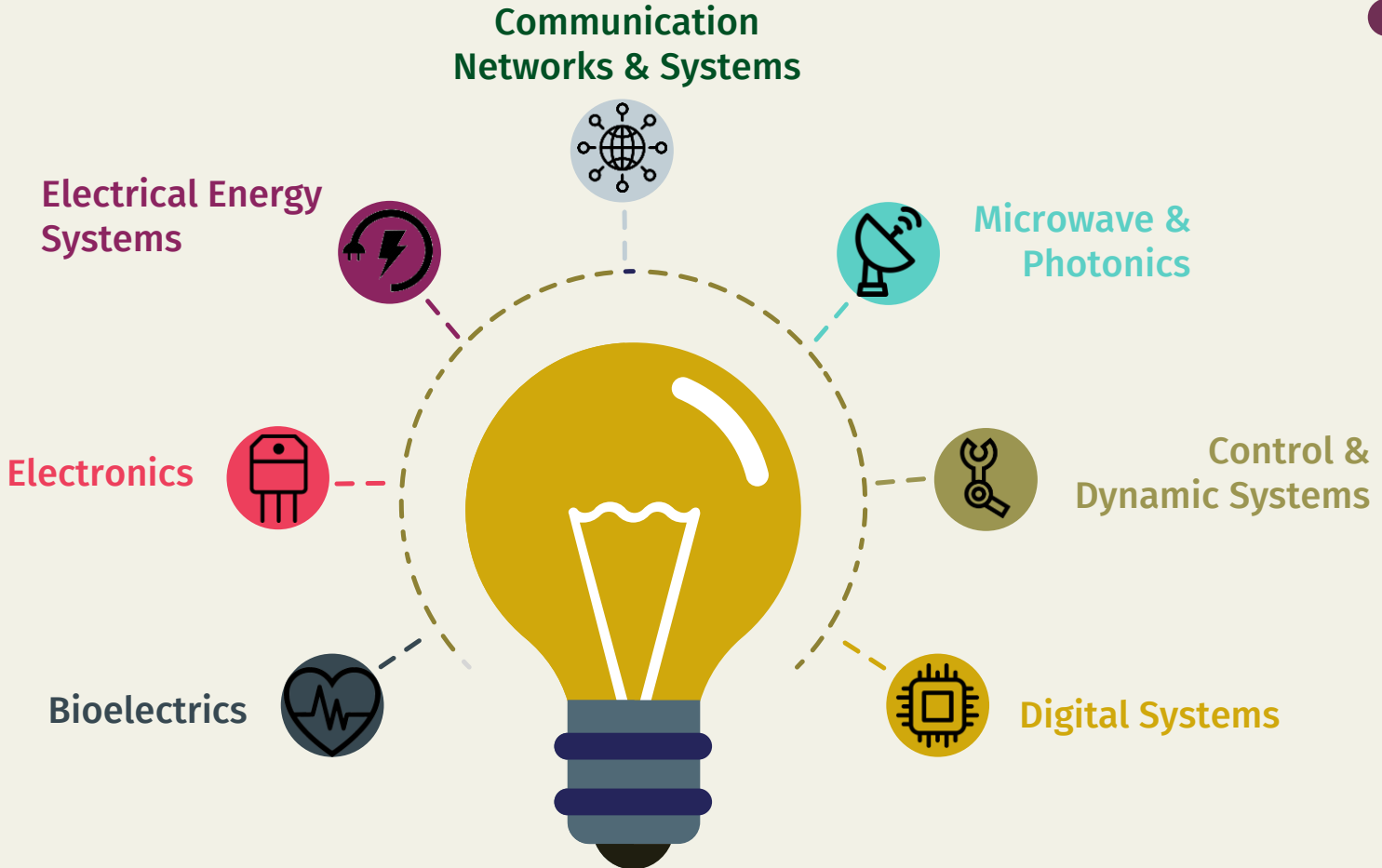




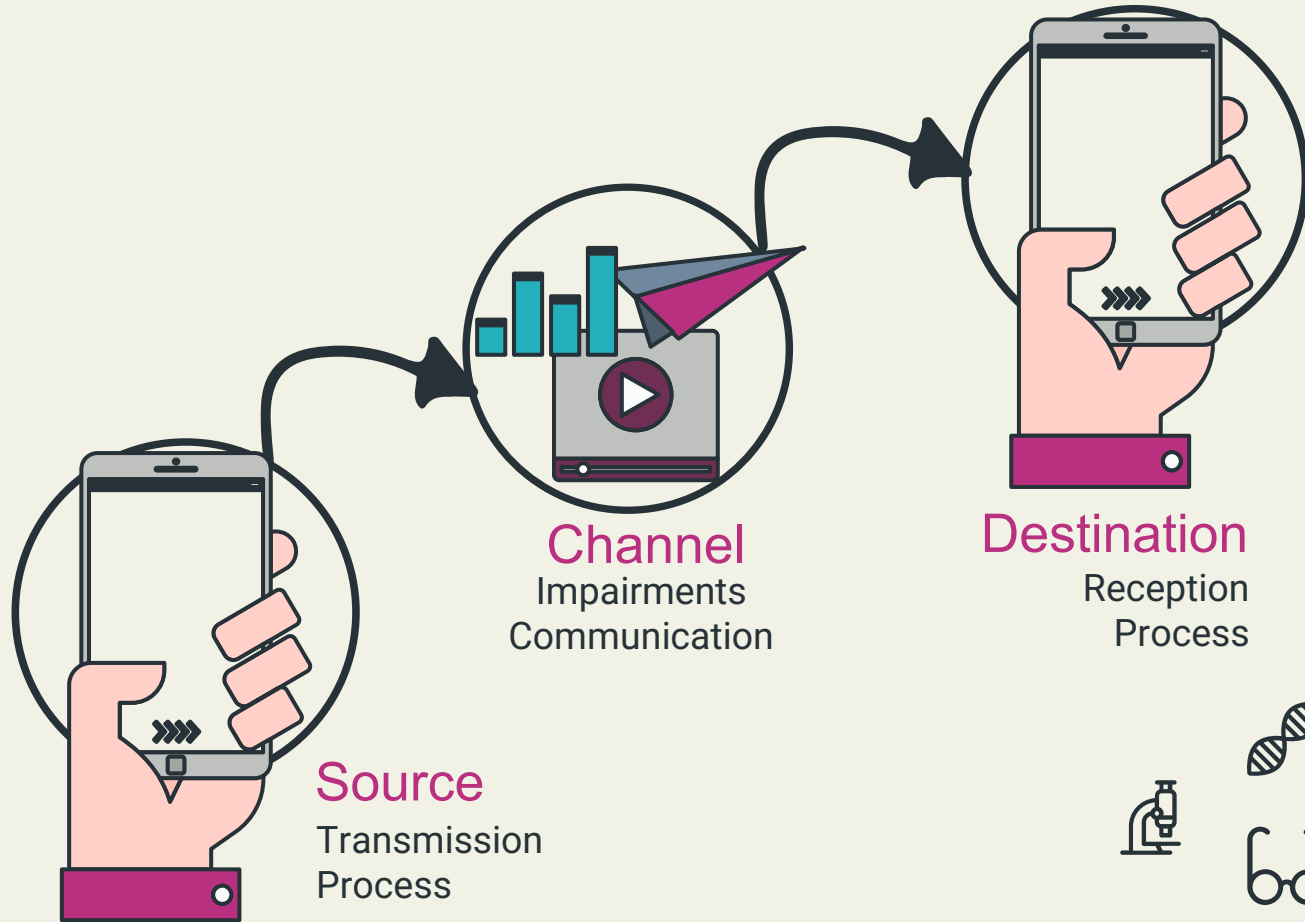
Communication Networks and Systems

A Concise Introduction
Arash Amini, Mohammad Hadi
Fall 2022

We are communications systems engineers!



We are everywhere!



Source

Transmission
Process

Channel
Impairments
Communication

Destination

Reception
Process



We have two wings!

Communication

- Radio communication
- Optical communication
- Satellite communication
- Radar communication
- Space communication
- Wire communication
- Wireless communication
- Quantum communication
- Microwave communication
- Broadcast communication
- Digital communication
- Analog communication
- Vehicular communication
- Molecular communication
- Visible light communication



Process

- Image processing
- Audio processing
- Signal processing
- Pattern recognition
- Data compression
- Data mining
- Machine learning
- Cryptography
- Coding theory
- Information theory
- Adaptive filters
- Numerical optimization
- Random Processes
- Blockchain
- Machine Vision

We are technical managers!

**Comprehensive
View**



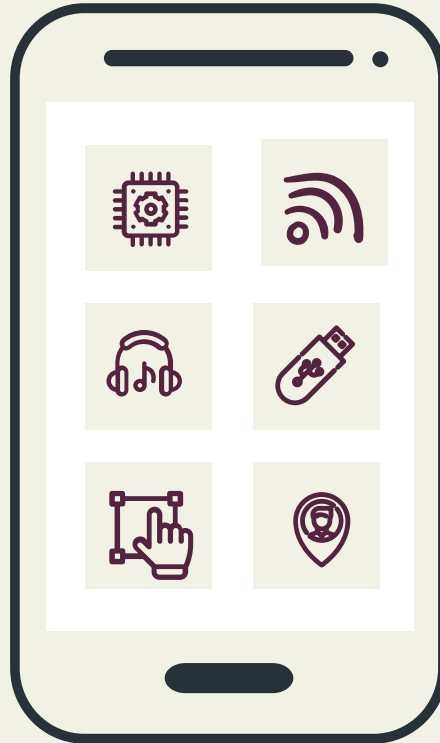
**Systematic
View**



**Interactive
View**



**Mathematical
View**



**Modular
View**



**Applied
View**



**Abstract
View**



**Algorithmic
View**

We are powerful!

18 faculty members



Many attractive courses



Various research works



Industrial collaboration



10 research labs



International collaboration

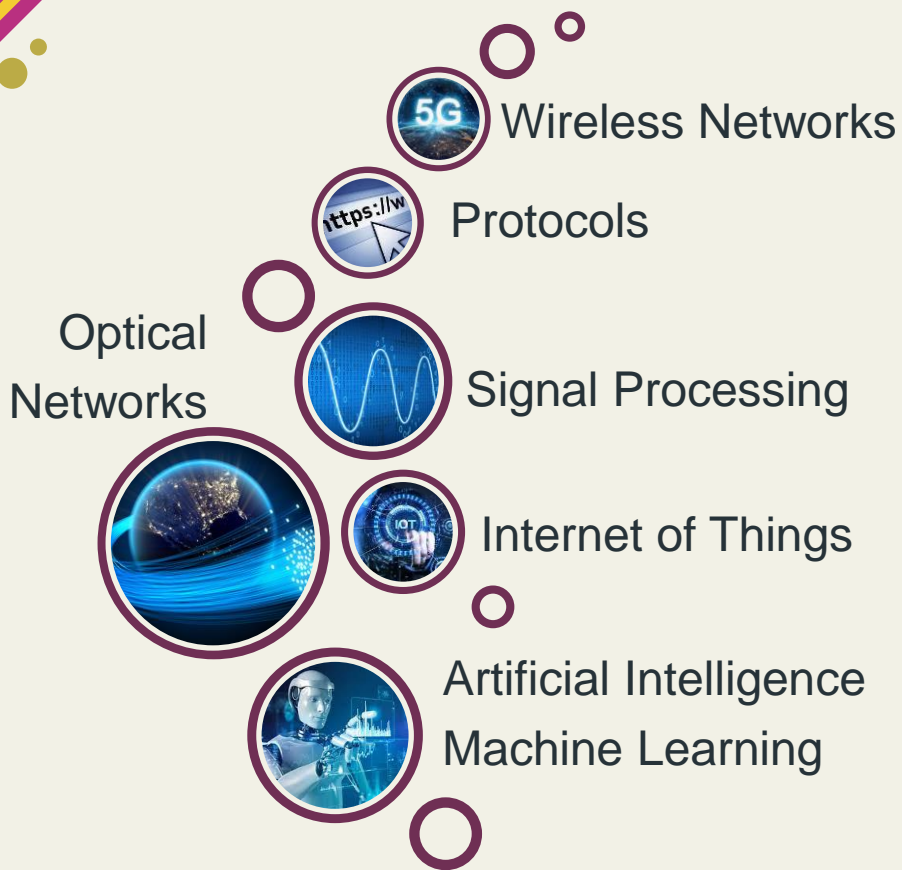


International Conferences

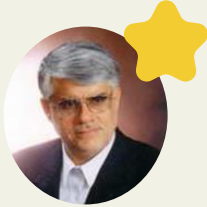


Two IEEE fellows

We are versatile!!



We are we!!!



M. Aref



M. Bastani



F. Behnia



M. Naebi



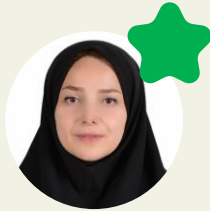
A. Amini



F. Ashtiani



M. Babaeizadeh



M. Mirmohseni



M. Pakravan



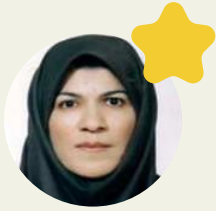
H. Behroozi



M. Karbasi



B. Khalaj



M. Nasiri



J. Salehi



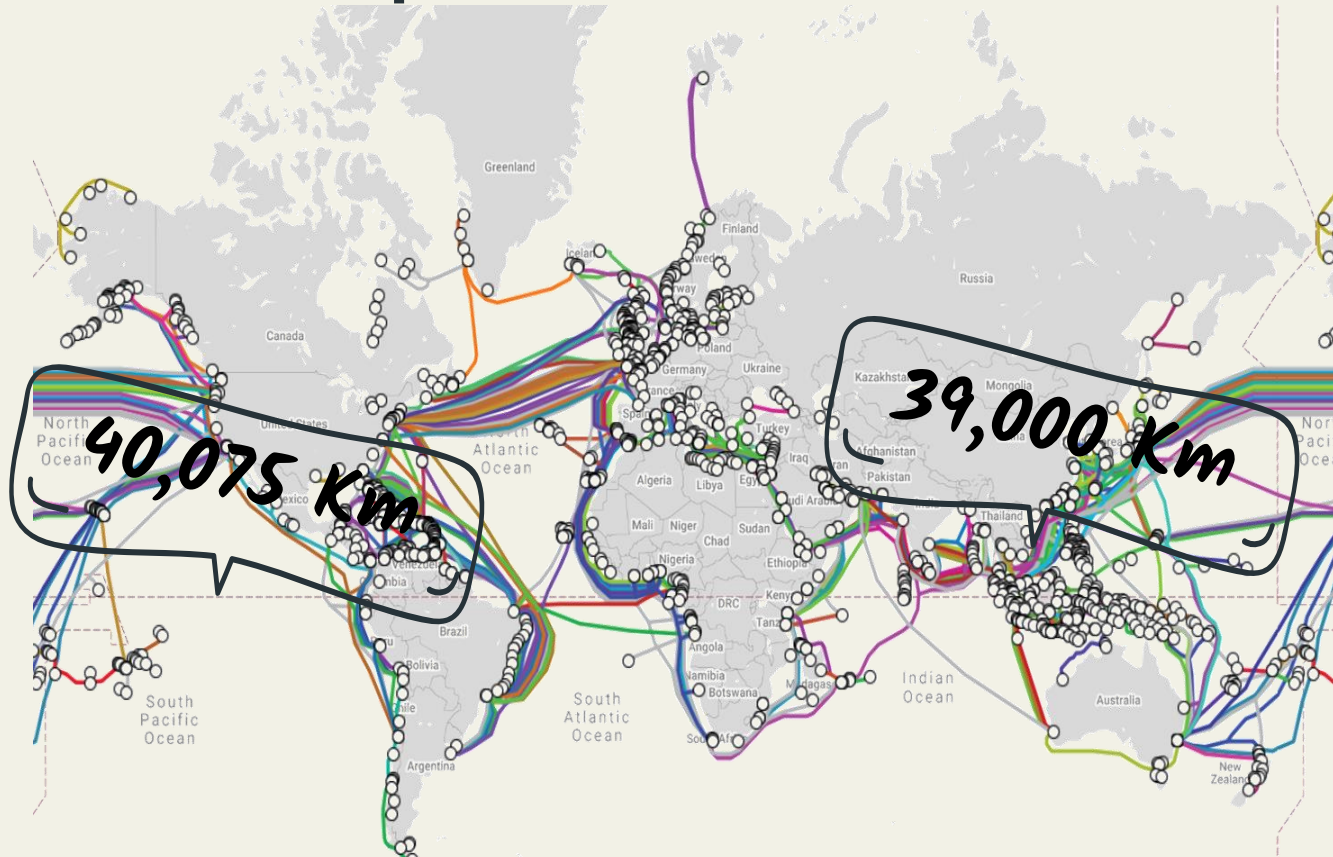
M. Yassaee



M. Hadi

We make it possible!

Optical communication



We make it possible!

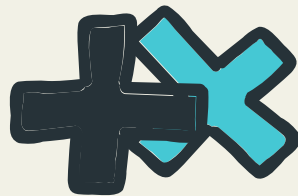
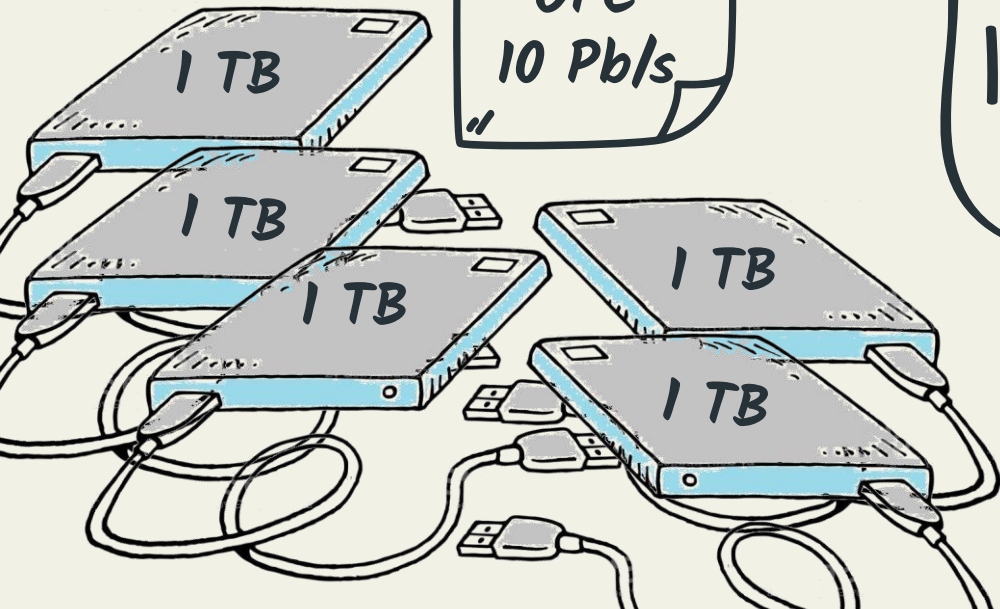
Optical communication



2020
OFC
10 Pb/s

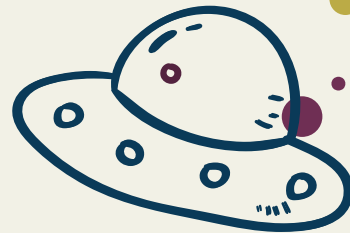


1137 1TB storage
per second!!!



We make it possible!

Deep space communication

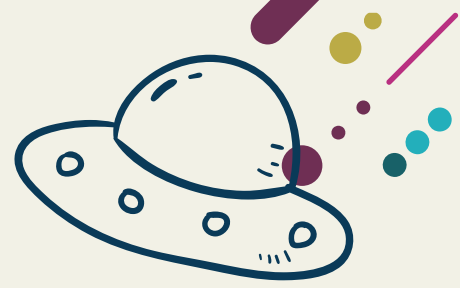


	Operator	Weight	Power	Distance	RTT	Rate
Rosetta	ESA (04-16)	1230 kg	850 W	4.66 AU	77.81 min	~100 kb/s
Cassini	NASA/ESA (97-17)	2523 kg	885 W	9.13 AU	2.54 h	~20 kb/s
Voyager 2	NASA (77-21)	721 kg	470 W	152.08 AU	1.76 d	~20 b/s



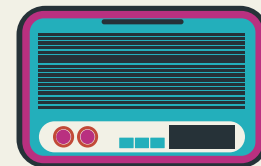
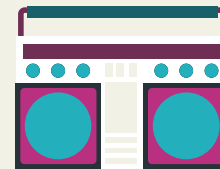
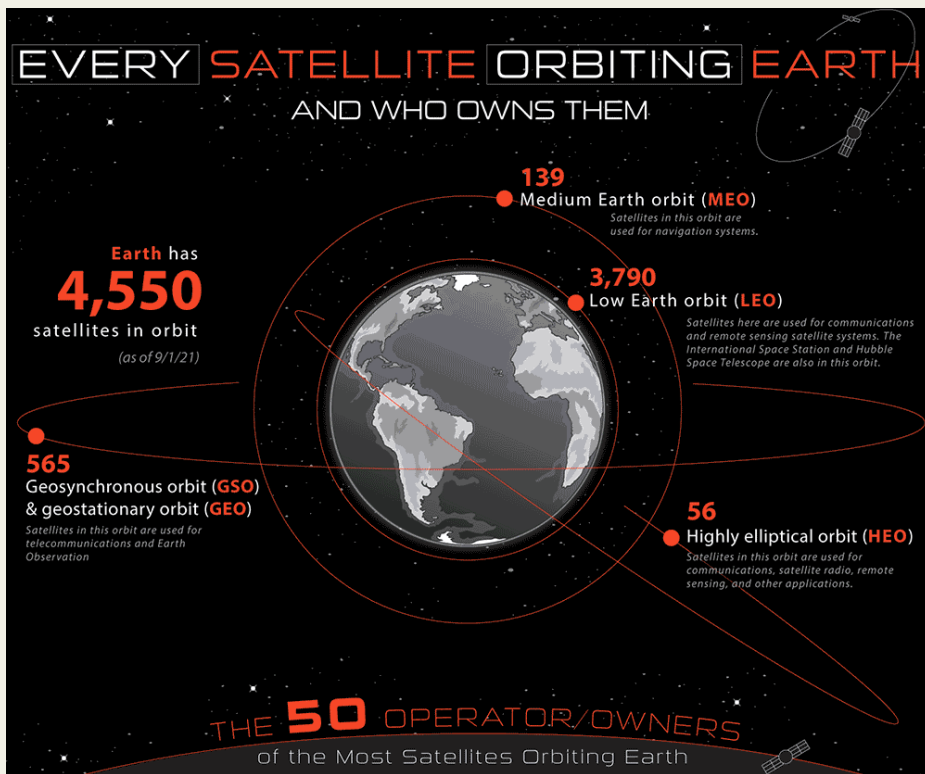
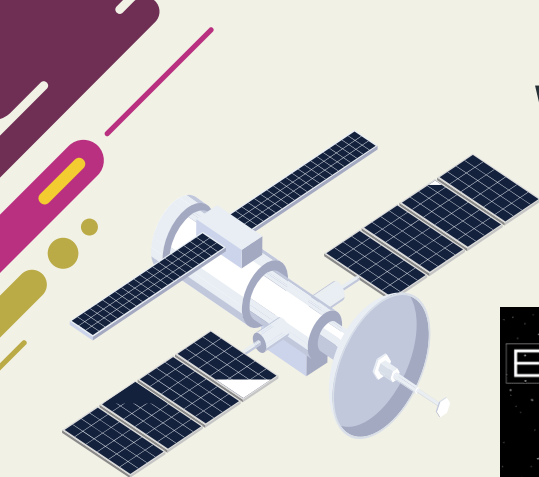
We make it possible!

Deep space communication



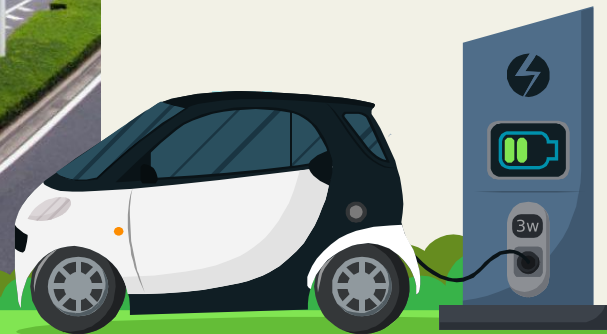
We make it possible!

Satellite communication



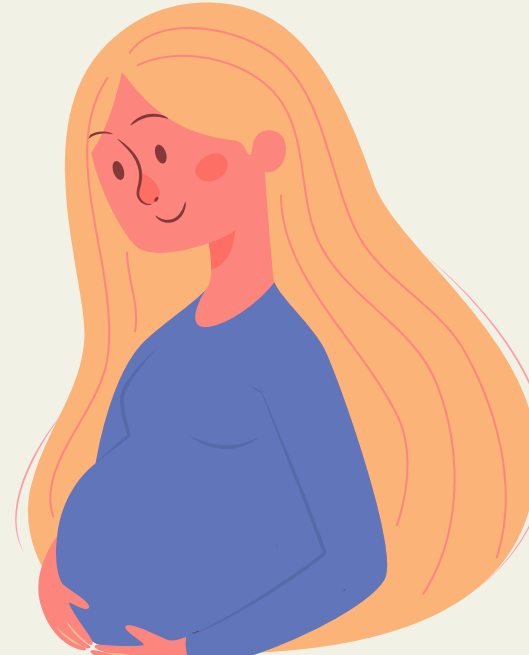
We make it possible!

Vehicular communication



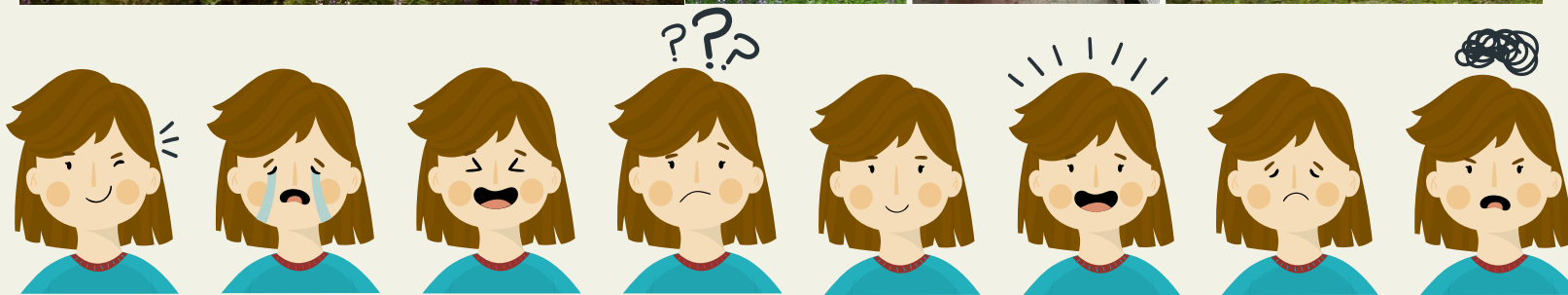
We make it possible!

Blind source separation



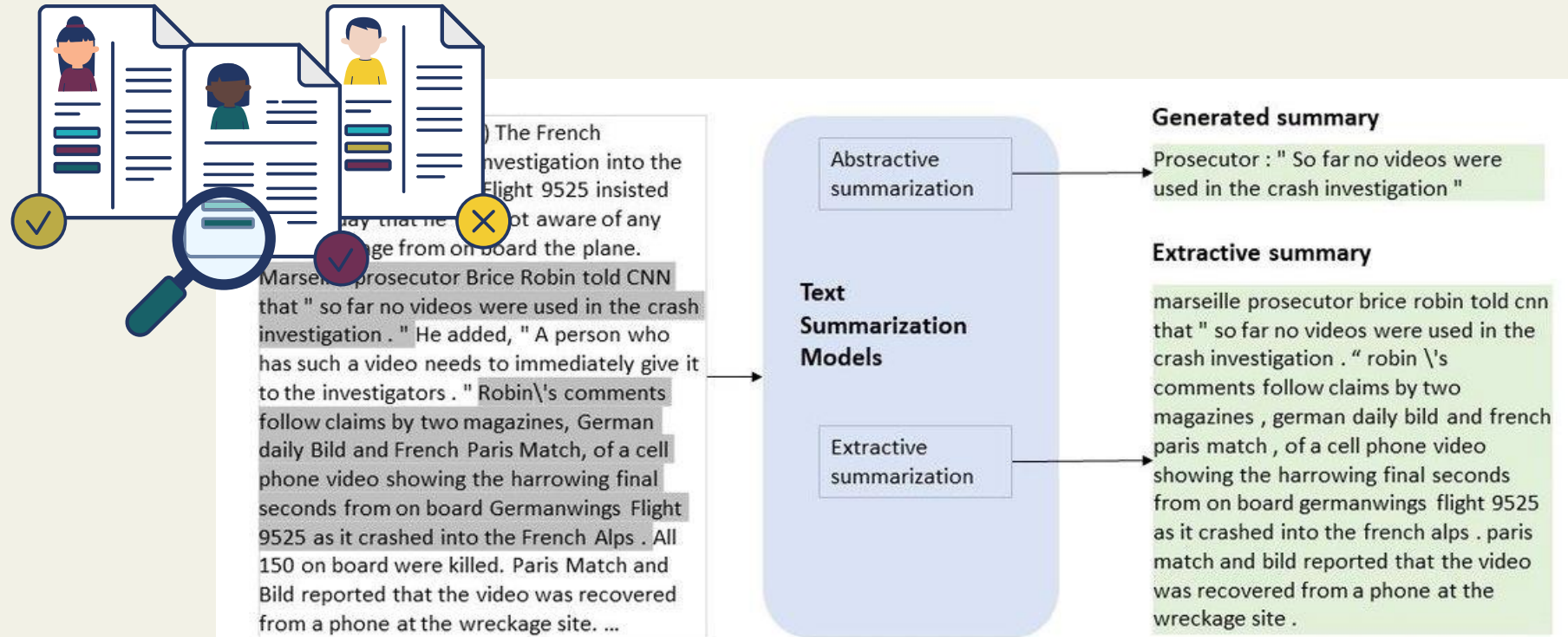
We make it possible!

Artificial intelligence



We make it possible!

Artificial intelligence



We make it possible!

Blockchain





**I found my
missing
love!**





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<http://ee.sharif.edu/~mohammad.hadi>



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