



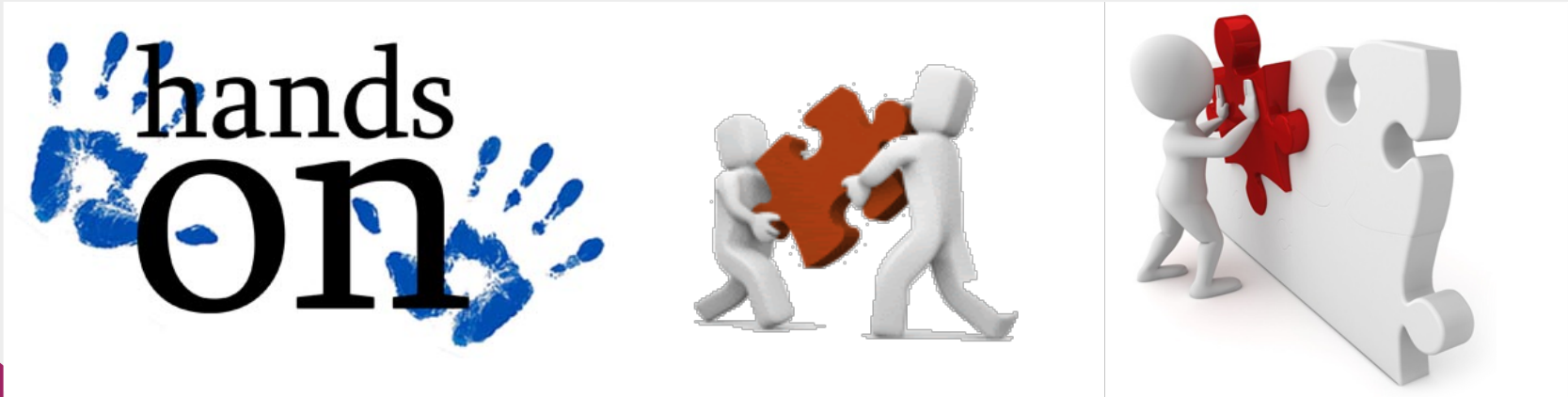
FinQ Case Study #1

Aircraft Loading Optimization

Orientation Meeting
2021-10-16

Purpose

- Hands-on experience – learning by doing
- Bridging the gap between academic research and industry applications
- Teamwork and connections

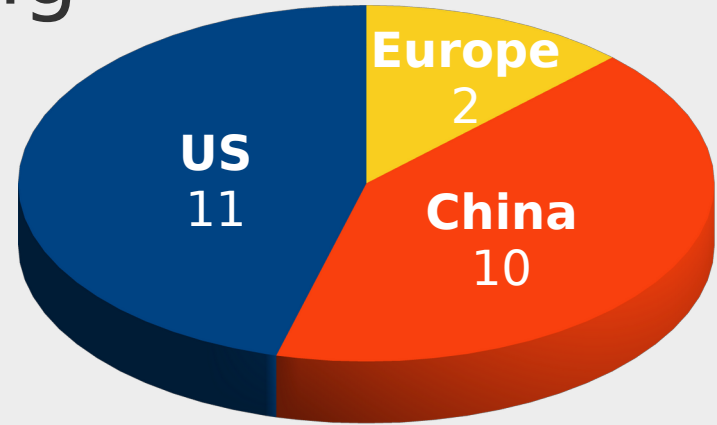


Schedule

- **October 16, 2021:** Orientation / kick-off
- **Week 1-2:** Reading materials, Q&A
- **Week 3-4:** Implementation & iteration
- **Week 5-6:** Brainstorming & adding features
- **Week 7-8:** Review & report composing
- **Office hours** at the end of each 2-week session
- **December 11, 2021:** Final presentation
-

Grouping

- 23 Participants
- 7 groups
 - 3 to 4 members per group
 - 1 group leader per group
- 2 greater groups
- All groups are expected to have their solutions
- Inter-group collaborations are welcome!



Grouping

地理位置国家和地区	称呼	微信昵称	微信ID	Group
美国	Mao Lin	Lin Mao	fagdfagdfagd	1
美国	Ke	superhead	4044569	1
美国	Yiwen	Even	yiwentoughguy	1
德国	Martin	Iceeee	SloveNat	2
瑞士	于乐宾	于乐宾	NibelYU	2
中国	丁齐鸣	Curry	ding13to14	2
中国	赵乾坤	Jason Mendel	M_Messi_Z	3
中国	金狮楠	nautilus	nautilus	3
中国	Hao	H	keepdadreams	3
美国	Jack Song	QResource_Unknown	kaminotesf524	4
中国	赵翔	赵翔	magelead	4
美国	敖敖	宴之敖	skkkkrrr	4
美国	Meng	华梦	华梦	5
中国	李祺	Richard	582938827	5
中国	James Xu	James X	smiles_2012	5
美国	效骁	xx	xx13791379	5
美国	许文超	许文超	409562878	6
中国	archwxw	王新文	archwxw	6
美国	Li Zeng	Li Zeng	wxid_xvao7v18o55n	6
美国	明	明	Keduo003	7
中国	Mark	Mark	themengmeng	7
中国	宇航员	宇航员Samura	宇航员Samura	7
美国	Shawn	夜行锦衣	xiangli61	7

- Greater group leader in **bold**
- Group leader in **highlight**

GitHub Repo

- We have a private GitHub repo:

finqtech/quantum-case-study-1

finqtech / quantum-case-study-1 Private

<> Code Issues Pull requests Actions Projects Security Insights Settings

main 1 branch 0 tags Go to file Add file Code

gromitsun Add group folders 3ca2bec 35 minutes ago 3 commits

group1	Add group folders	35 minutes ago
group2	Add group folders	35 minutes ago
group3	Add group folders	35 minutes ago
group4	Add group folders	35 minutes ago
group5	Add group folders	35 minutes ago
group6	Add group folders	35 minutes ago
group7	Add group folders	35 minutes ago
.gitignore	Initial commit	4 days ago
LICENSE	Initial commit	4 days ago
README.md	Update README.md	6 hours ago

README.md

Quantum Case Study 1 - Aircraft Loading Optimisation with QUBO

Recently, Airbus announced their winner to The "Airbus Quantum Computing Challenge" (AQCC): the team Machine Learning Reply (MLR). In the fifth challenge -- "Aircraft Loading Optimisation", they formulated the problem and its constraints into cost functions in the form of Quadratic Unconstrained Binary Optimization (QUBO) problems. These cost functions are compatible with quantum annealers, as well as other hybrid classical-quantum optimization algorithms such as Quantum Approximate Optimization Algorithm (QAOA). Then they benchmarked the model on different solvers to evaluate the performances and capabilities of current technologies. In our case study, we will try to reimplement MLR's approach in Python. Then, we can think of ways to improve their method, such as adding additional constraints and features. Note that although the published algorithm is based on quantum annealing, we are not limited to use only quantum annealing. Other optimization algorithms such as QAOA are also encouraged to be explored. We expect that most participants would finish their assignments within 8 weeks, with a 4-hour weekly commitment and one 1-hour meeting biweekly. We will host an orientation / kick-off on October 16, 2021 and the session will conclude on December 11, 2021. Participants would work together in groups of 3 or less. In this session, we plan to have a maximum of 3 groups.

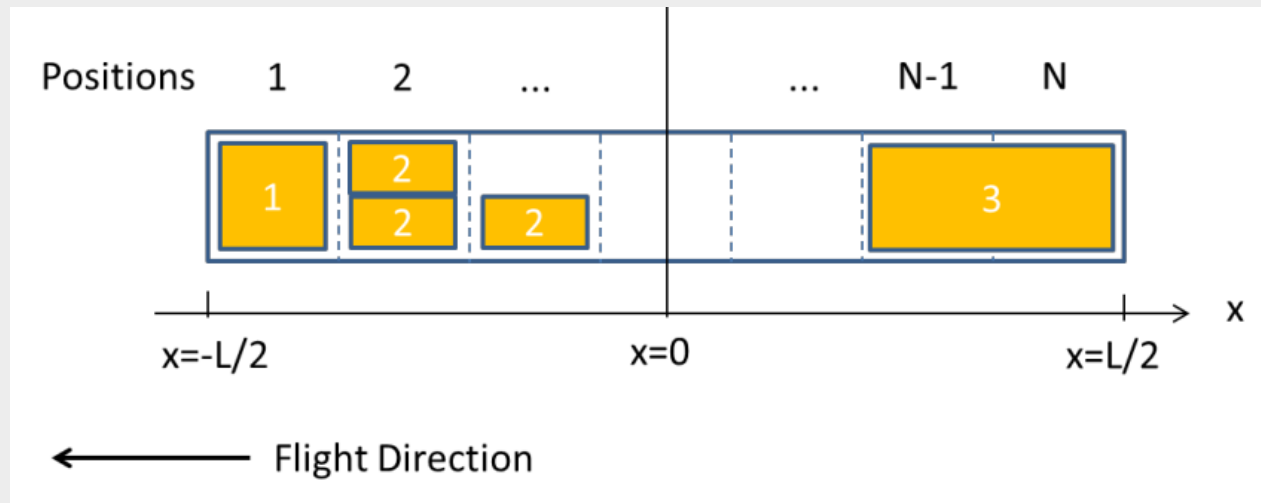
Evaluation and Awards

- All groups will be evaluated after all final presentations.
- Top groups will be awarded a **prize**.



The Problem

- Aircraft loading optimization



Objectives

- Total mass (primary)
- Center of gravity (secondary)

Constraints

- Payload
- Center of gravity limit
- Shear limit

Suggested Tools

- Algorithms
 - QAOA
 - VQE
 - Quantum Annealing
- Implementation
 - Python – NumPy / SciPy
 - Qiskit / cirq / pennylane





Questions?

Let's have fun
learning together!