Technology Review

Wind Tunnel Data Analysis

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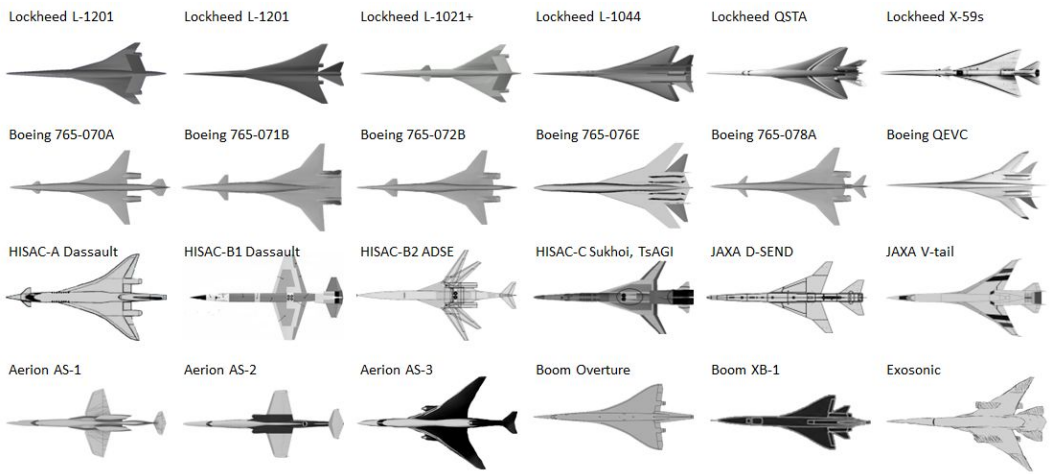
Background

Supersonic airliners/SSBJs are optimized at cruise speed and often neglect low-speed impact at takeoff, approach, and landing.

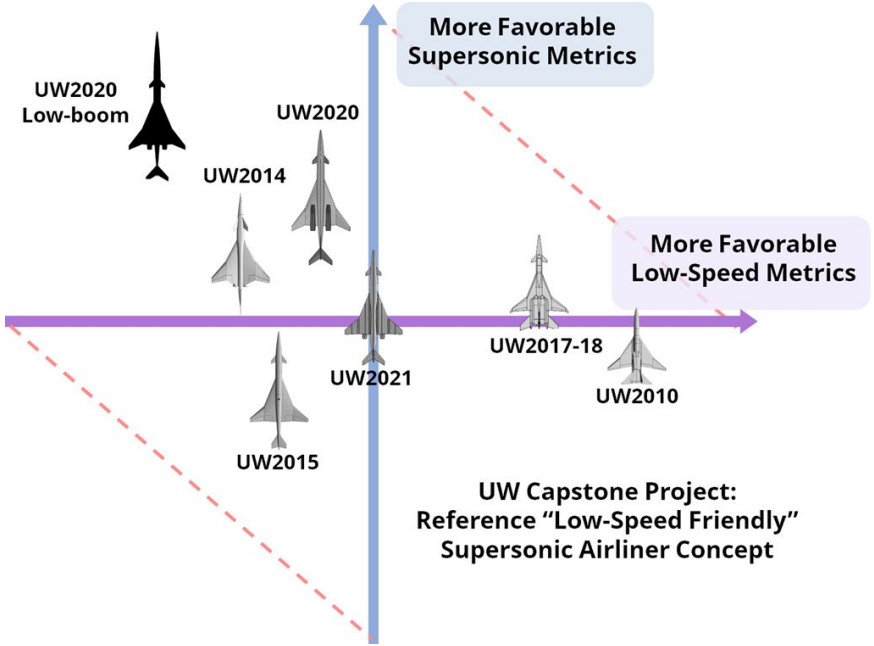
Studies on how the shapes and configurations affect the aircraft's aerodynamics, handling qualities, dynamic, stability and control.



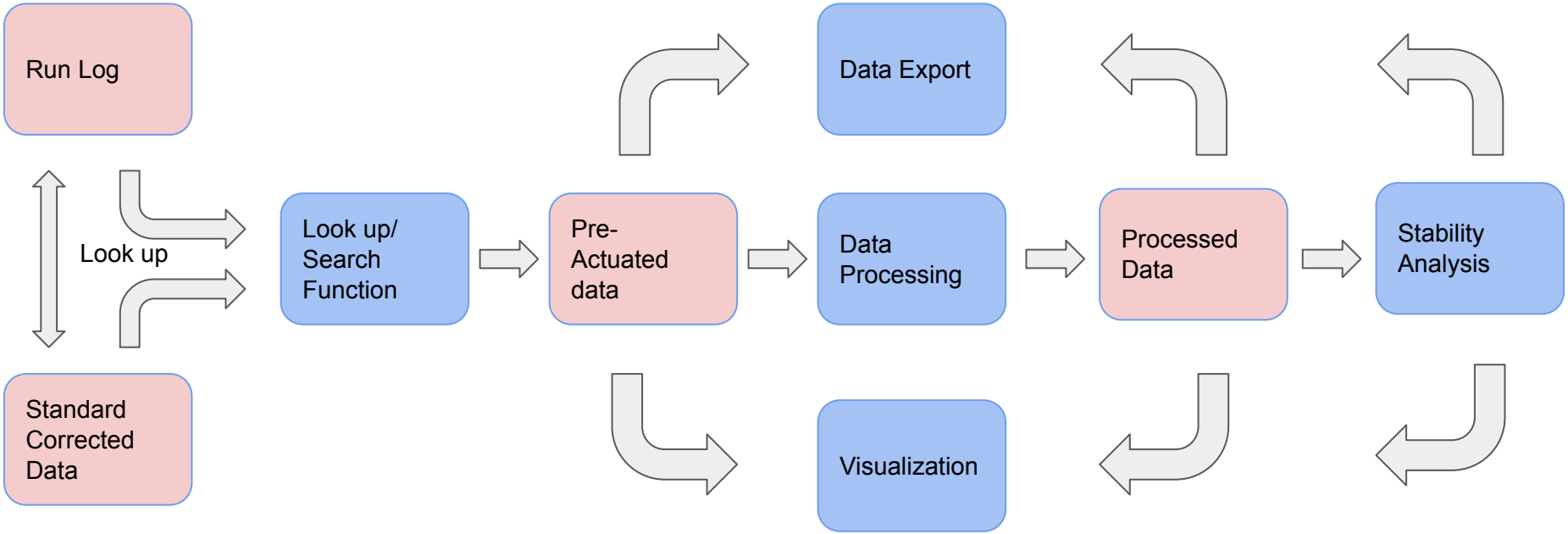
Project

This project aims to analyze the experimental wind tunnel data for design space and trade-off study of supersonic airliner/ business jet at low speeds.

The goal is to extract the commercial wind tunnel standard corrected data for look-up, search, process, and visualization.



Workflow Chart



Technology Considered - 1

1. **Numpy** [Scientific computing][Ndarray: multidimensional array][Fast operations]
2. **Pandas** [Less coding][Extensive feature set][Efficient for large dataset] [Collaboration with other packages]
3. **Basic Python Data Structure**(Set/List/Tuple/Dictionary) [Simple Syntax]
4. **Scipy** [Fast computational power][A variety of sub-packages]

Technology Considered - 2

5. **Matplotlib** [Simple to grasp for beginners][Matlab][Collaboration with other packages]
6. **Altair** [Interactive data visualization]
7. **Seaborn** [high-level interface for drawing attractive statistical graphics]
8. **Streamlit** [The fastest way to build and share data apps]
9. **Pandas GUI** [Collaboration with Pandas][Reframing the dataframe]

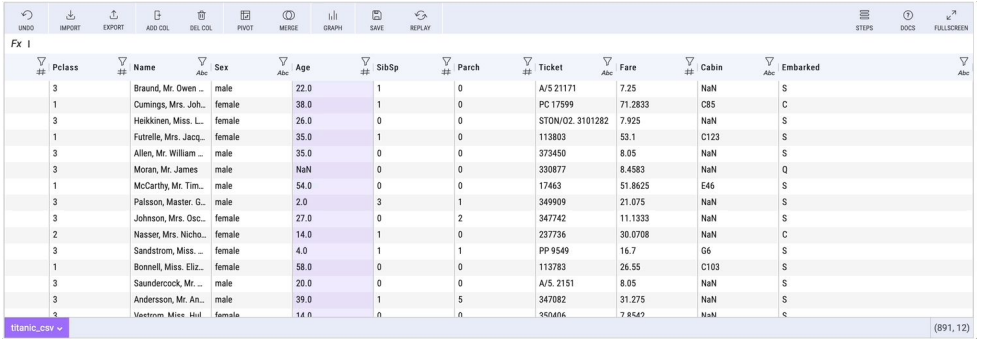
Choice

01	Search Function:	Pandas	
02	Data Extraction:	Pandas	
03	Data Process:	Numpy, Scipy	
04	Data Visualization:	Altair,Streamlit	
05	User Interface:	Pandas GUI	

Appeal of Choice

pandas

Pandas: Data Manipulation



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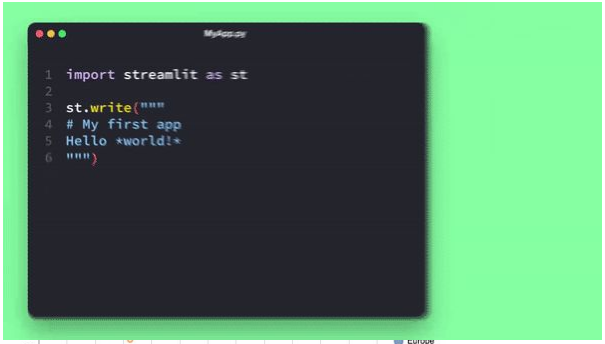
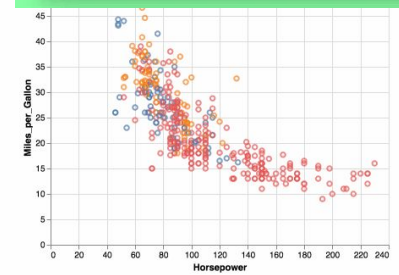
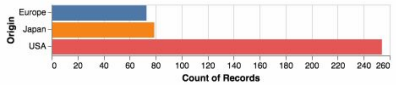
	3	Braund, Mr. Owen ...	male	22.0	1	0	A/5 21171	7.25	NaN	S
	1	Cumings, Mrs. Joh...	female	38.0	1	0	PC 17599	71.2833	C85	C
	3	Heikkinen, Miss. L...	female	26.0	0	0	STON/O2. 3101282	7.925	NaN	S
	1	Futrelle, Mrs. Jacq...	female	35.0	1	0	113803	53.1	C123	S
	3	Allen, Mr. William ...	male	35.0	0	0	373450	8.05	NaN	S
	3	Moran, Mr. James	male	NaN	0	0	330877	8.4583	NaN	Q
	1	McCarthy, Mr. Tim...	male	54.0	0	0	17463	51.8625	E46	S
	3	Palsson, Master. G...	male	2.0	3	1	349909	21.075	NaN	S
	3	Johnson, Mrs. Osc...	female	27.0	0	2	347742	11.1333	NaN	S
	2	Nasser, Mrs. Nicho...	female	14.0	1	0	237736	30.0708	NaN	C
	3	Sandstrom, Miss. ...	female	4.0	1	1	PP 9549	16.7	G6	S
	1	Bonnell, Miss. Eliz...	female	58.0	0	0	113783	26.55	C103	S
	3	Saundercock, Mr. ...	male	20.0	0	0	A/5. 2151	8.05	NaN	S
	3	Andersson, Mr. An...	male	39.0	1	5	347082	31.275	NaN	S

Pandas GUI: User friendly Interaction





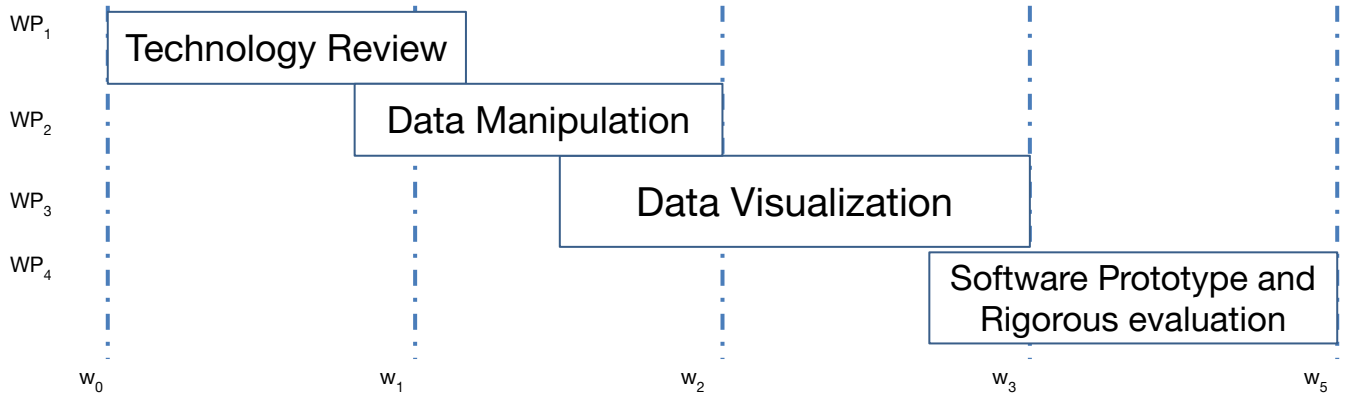


Altair

Drawback of choice

1. **Pandas** [Complex syntax][Not ok for 3D matrices]
2. **Altair** [Not as customizable][Not for 3D visualization]
3. **Streamlit** [inefficient]
4. **Pandas GUI**[Need internet connection, Annaconda]

Project Deliverables & Timeline



Project work-packages in Gantt-chart

WP_4 : Working Progress
w_3 : Week

Other packages

- Plotly
- Bokeh

Visualization

- Streamlit
- Plotly
- Bokeh
- Kivy

Next Thu. every project will present
Max 5 minutes – I will cut you off

Everyone in the team will speak
Background: your application and why you want to use it, 1 slide
What technologies you considered: 1 slide
Choice: what you chose to use, summary of how it works, 1 slide
Appeal of choice: 1 slide
Drawbacks of choice: 1 slide

Things to think about, as a starting point:
Availability of relevant examples
Look at open issues on GitHub

Technology Considered

1. Numpy
2. Pandas [Less coding][Extensive feature set][Efficient for large dataset] [Collaboration with other packages]
3. Basic Python Data Structure(Set/List/Tuple/Dictionary) [Simple Syntax]
4. Matplotlib
5. Altair
6. Streamlit

Need to search packages to use

Streamlit (i/o)

Relevant Examples & Existing Issues

https://github.com/Lepresean/Wind_Tunnel_Force_Post-processing

Pros: Could handle multiple csv files

Cons: Written in MATLAB, Visualization is not perfect for our requirements