MDS

Assignment 4

→ **Prognostics and Health Management**

T A

/CONTENT/

01 Problem Statement

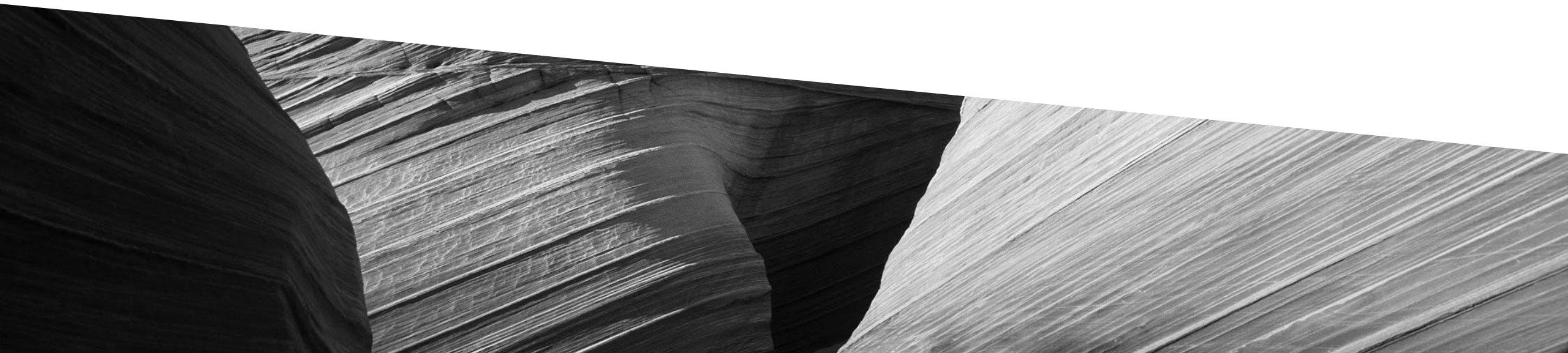**02** Data Preparation
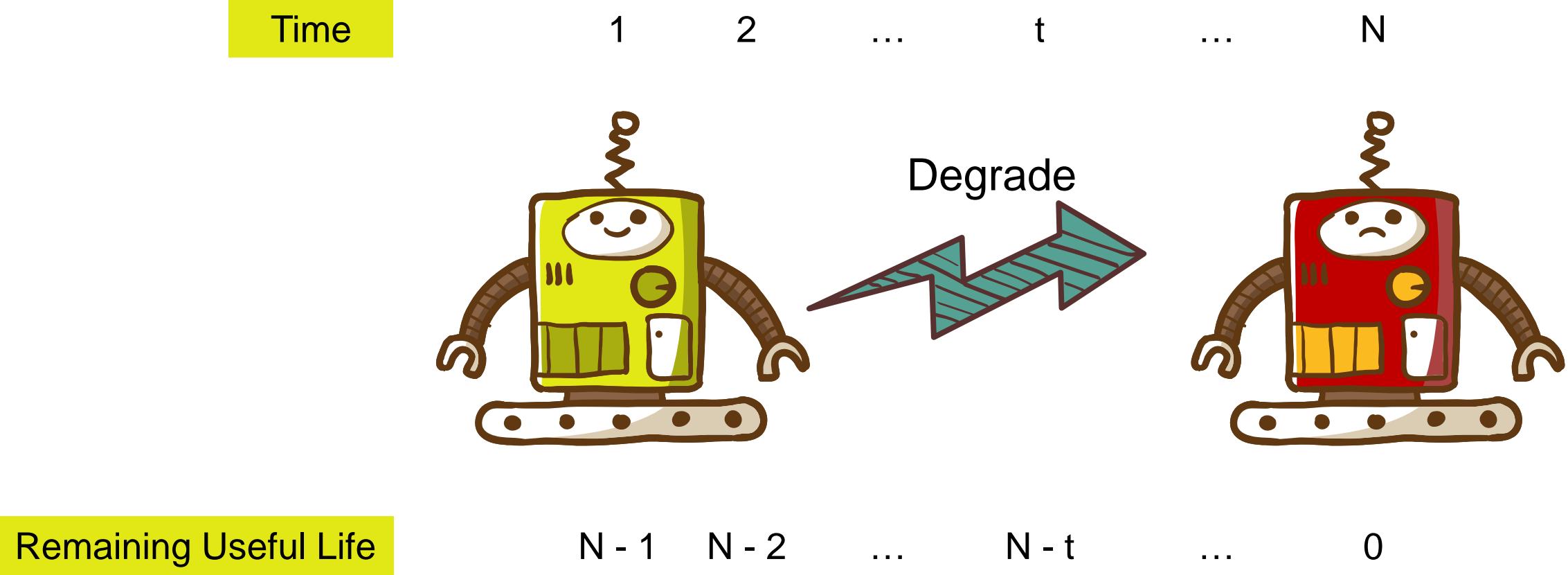
03 Questions
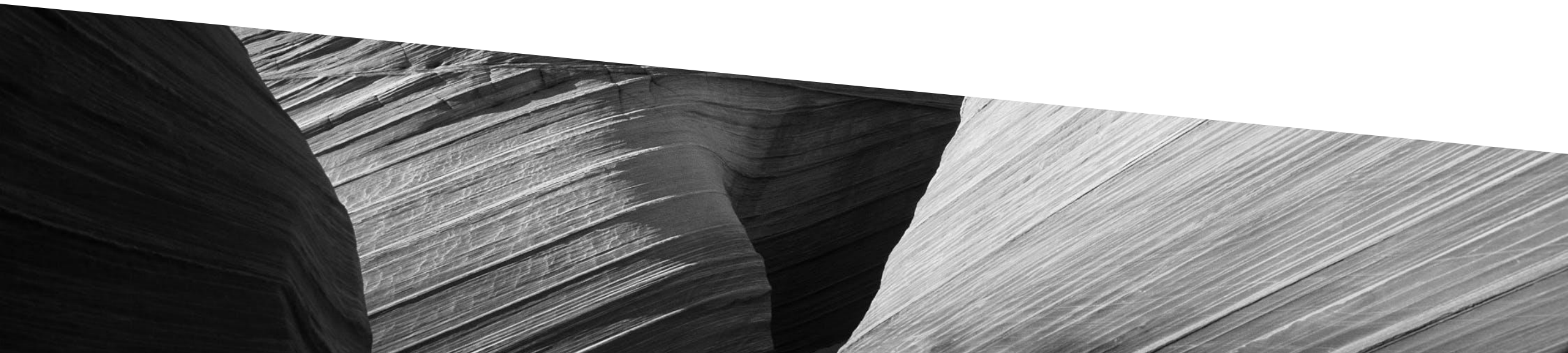
/01 **Problem Statement**

Problem Statement

Time   1   2   ...   t   ...   N

Degrade

Remaining Useful Life   N - 1   N - 2   ...   N - t   ...   0

/02 **Data Preparation**

Dataset

- Maximum value of 'time' is its **lifetime**.

3 **operational setting**

21 **sensor measurement**

→ **We will focus on these features.**

	unit number	time	operational setting 1	operational setting 2	operational setting 3	sensor measurement 1	...	sensor measurement 16	sensor measurement 17	sensor measurement 18	sensor measurement 19	sensor measurement 20	sensor measurement 21
0	1	1	10.0047	0.2501	20.0	489.05	...	0.03	368	2319	100.0	28.58	17.1735
1	1	2	0.0015	0.0003	100.0	518.67	...	0.03	391	2388	100.0	38.99	23.3619
2	1	3	34.9986	0.8401	60.0	449.44	...	0.02	334	2223	100.0	14.83	8.8555
3	1	4	20.0031	0.7005	0.0	491.19	...	0.02	364	2324	100.0	24.42	14.7832
4	1	5	42.0041	0.8405	40.0	445.00	...	0.02	330	2212	100.0	10.99	6.4025
...	...	...	...	...	...	...		...	...	...	...	...	...
218	1	219	35.0073	0.8400	60.0	449.44	...	0.02	337	2223	100.0	14.82	8.7966
219	1	220	35.0027	0.8400	60.0	449.44	...	0.02	338	2223	100.0	14.75	8.8290
220	1	221	0.0008	0.0000	100.0	518.67	...	0.03	394	2388	100.0	38.67	23.0218
221	1	222	20.0003	0.7001	0.0	491.19	...	0.03	369	2324	100.0	24.28	14.5645
222	1	223	34.9992	0.8400	60.0	449.44	...	0.02	337	2223	100.0	14.70	8.6695

- Consider **'unit number' == 1** only

Remaining Useful Life (RUL) Calculation

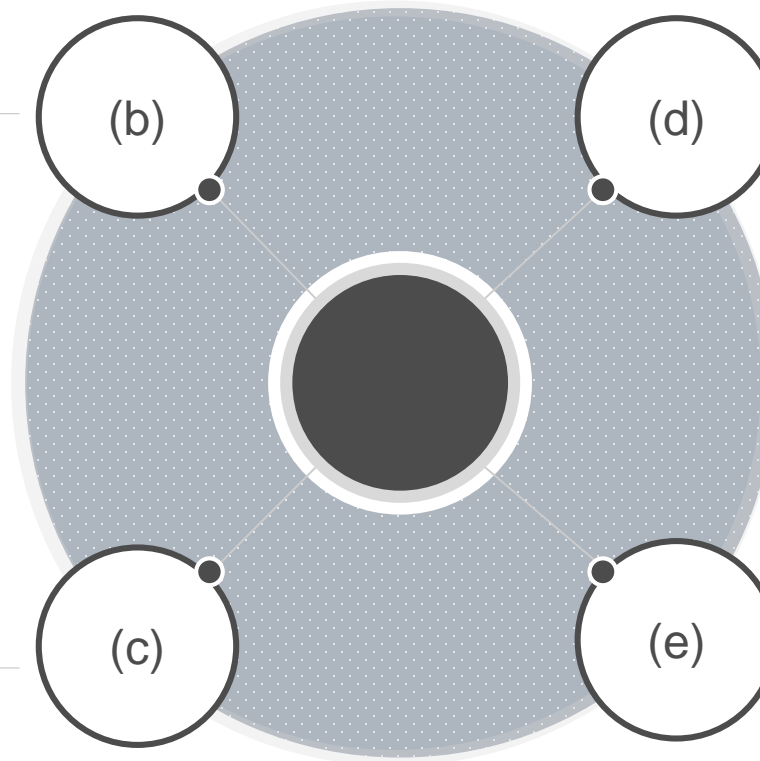|	unit number	time	operational setting 1	operational setting 2	operational setting 3	sensor measurement 1	...	sensor measurement 16	sensor measurement 17	sens
0	1	1	10.0047	0.2501	20.0	489.05	...	0.03	368	
1	1	2	0.0015	0.0003	100.0	518.67	...	0.03	391	
2	1	3	34.9986	0.8401	60.0	449.44	...	0.02	334	
3	1	4	20.0031	0.7005	0.0	491.19	...	0.02	364	
4	1	5	42.0041	0.8405	40.0	445.00	...	0.02	330	
...	...	...	...	...	...	... ...		...	...	
218	1	219	35.0073	0.8400	60.0	449.44	...	0.02	337	
219	1	220	35.0027	0.8400	60.0	449.44	...	0.02	338	
220	1	221	0.0008	0.0000	100.0	518.67	...	0.03	394	
221	1	222	20.0003	0.7001	0.0	491.19	...	0.03	369	
222	1	223	34.9992	0.8400	60.0	449.44	...	0.02	337	

RUL = lifetime – time

y, label

/03 Questions
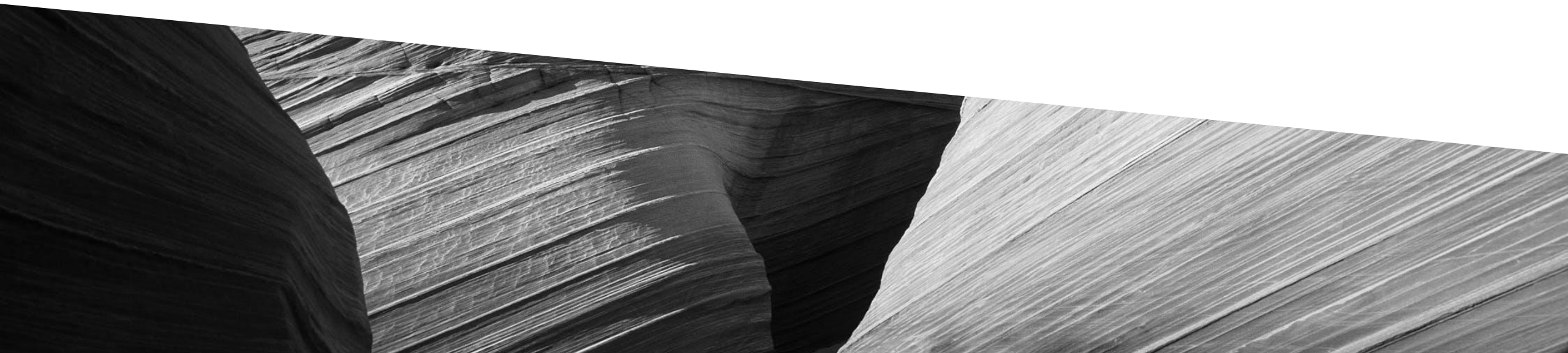
Questions

Variation Analysis

- calculate the coefficient of variation
- $cv = \dfrac{\sigma \text{ (standard deviation)}}{\mu \text{ (mean)}}$

(b)

(d)

Feature Selection 1

- Perform moving average on RUL column
- Calculate Pearson correlation coefficient between generated features and RUL

Feature Engineering

- For each sensor
  - Moving average
  - Variance
  - Max value
- .rolling() in pandas (decide window size by yourself)

(c)

(e)

Feature Selection 2

- Obtain feature importance by random forest
- Show the line plot

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Thanks

Good Luck!

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