Result Extraction and Analysis

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Problem statement

- Given a Portable Document Format(PDF) of the college result, design and develop an application that is able to extract the marks, and store it in a ready-to-analyse format
- Develop a module that is further able to perform the analysis on the individual scores. This includes:
  - Calculating the 5 stat figure (min, lower quartile, median, upper quartile, max)
  - Calculate standard deviation in each subject
  - Present this data in a tabular format
  - Additional histograms for graphical visualization of performance of students

Technology stack

- Web application: Python flask

- Data analysis and visualization: Python Pandas, Seaborn, matplotlib, weasyprint

- Data extractor: (Pdf to CSV module) : Java 8, Maven, Apache PdfBox

Method adopted : Data Extraction

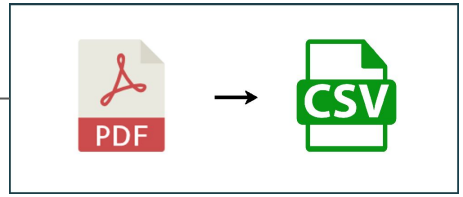
- Tokenize the lines using space as delimiter
- Based on the department, year and semester we find the rule file and load it in a map
- These rules are then used to parse each and every result in the pdf. These are then stored temporarily in member as list of objects
- After the entire pdf is parsed, we convert the list of objects into a csv

Method adopted: Analysis and visualization

- CSV data is loaded in Pandas dataframe
- Subsequently, the 5 value summary, standard deviation are obtained
- Bar plots are done using matplotlib
- The outputs are saved as html. After that html files are converted into pdf format, using the weasyprint library
- Finally, the results analysis are merged and presented in pdf form

Challenges

- Handling anomalous formats: students with backlog often have varying schema
- Handling line overflows in pdf
- Handle NaN values, for eg, absent students have score: (AB/50)
- Fill up the gap of first year result of diploma students by substituting the mean



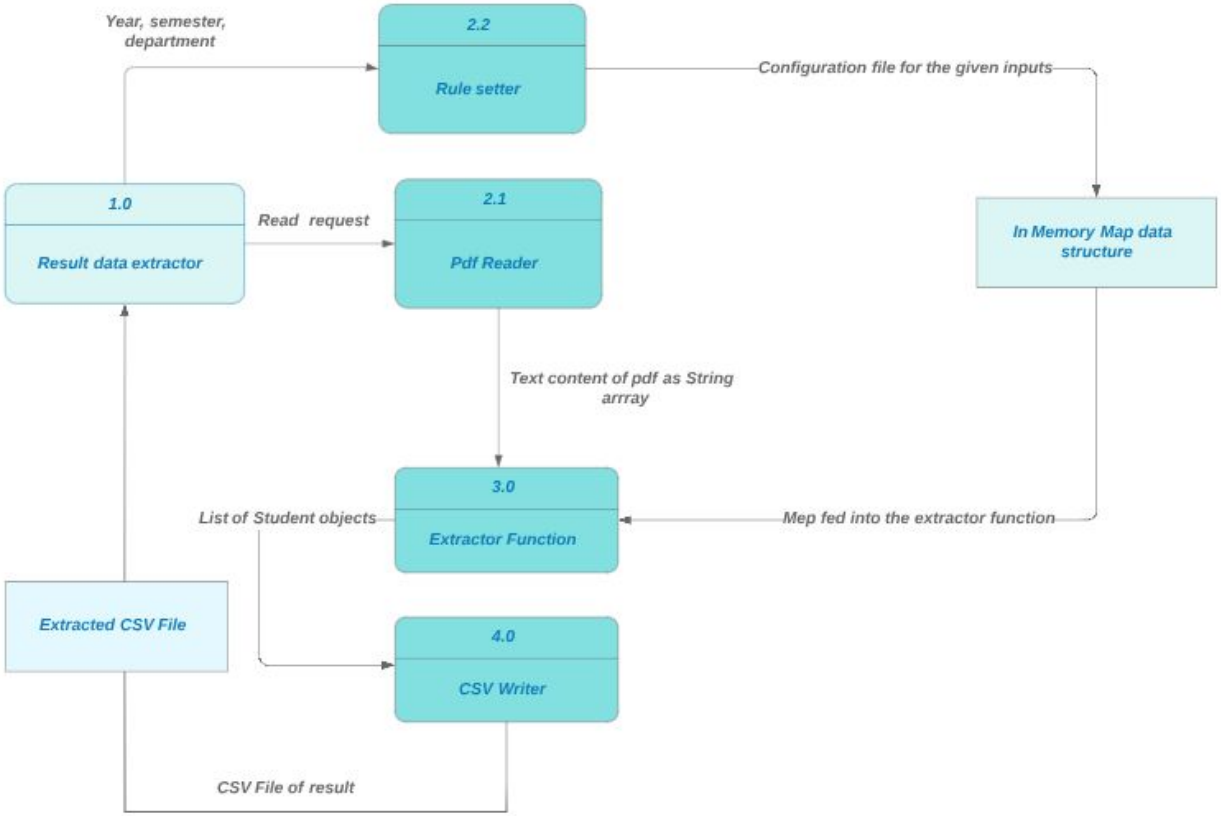
Pdf to csv converter

Api: localhost:5000/pdftocsv

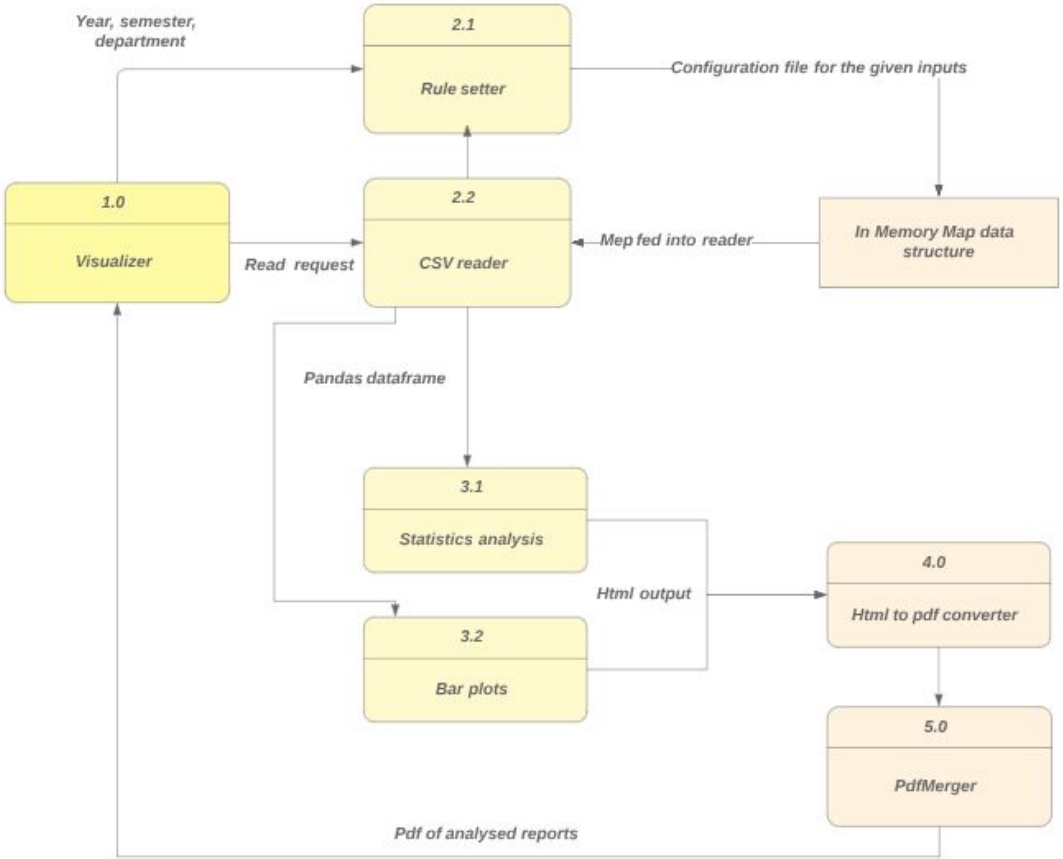
Web application

Data analysis and visualization

Api: localhost:5000/analytics

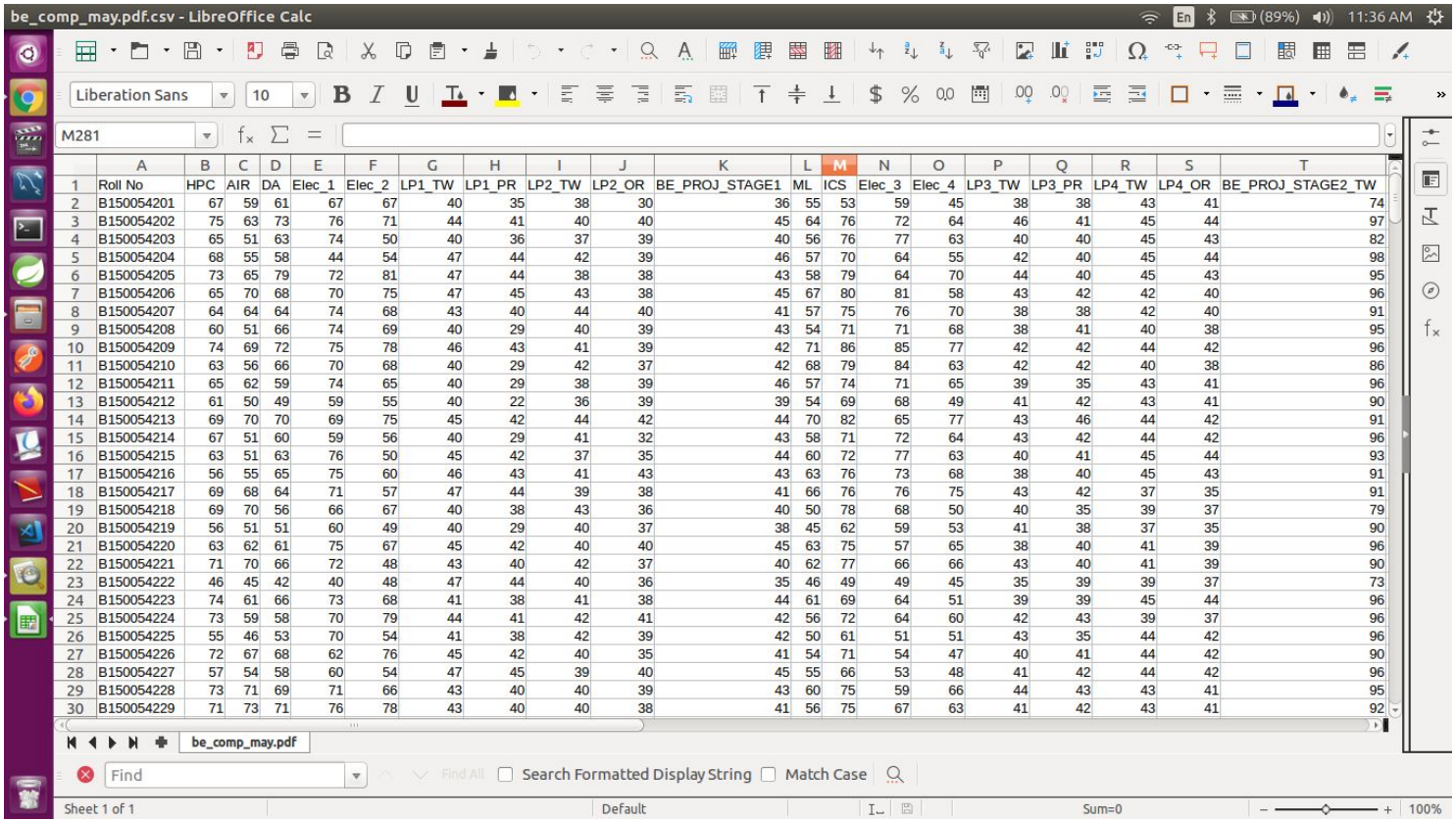


Data flow diagram of pdf extractor



Data flow diagram for visualizer

Results: Extracted csv



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	Roll No	HPC	AIR	DA	Elec_1	Elec_2	LP1_TW	LP1_PR	LP2_TW	LP2_OR	BE_PROJ_STAGE1	ML	ICS	Elec_3	Elec_4	LP3_TW	LP3_PR	LP4_TW	LP4_OR	BE_PROJ_STAGE2_TW
2	B150054201	67	59	61	67	67	40	35	38	30	36	55	53	59	45	38	38	43	41	74
3	B150054202	75	63	73	76	71	44	41	40	40	45	64	76	72	64	46	41	45	44	97
4	B150054203	65	51	63	74	50	40	36	37	39	40	56	76	77	63	40	40	45	43	82
5	B150054204	68	55	58	44	54	47	44	42	39	46	57	70	64	55	42	40	45	44	98
6	B150054205	73	65	79	72	81	47	44	38	38	43	58	79	64	70	44	40	45	43	95
7	B150054206	65	70	68	70	75	47	45	43	38	45	67	80	81	58	43	42	42	40	96
8	B150054207	64	64	64	74	68	43	40	44	40	41	57	75	76	70	38	38	42	40	91
9	B150054208	60	51	66	74	69	40	29	40	39	43	54	71	71	68	38	41	40	38	95
10	B150054209	74	69	72	75	78	46	43	41	39	42	71	86	85	77	42	42	44	42	96
11	B150054210	63	56	66	70	68	40	29	42	37	42	68	79	84	63	42	42	40	38	86
12	B150054211	65	62	59	74	65	40	29	38	39	46	57	74	71	65	39	35	43	41	96
13	B150054212	61	50	49	59	55	40	22	36	39	39	54	69	68	49	41	42	43	41	90
14	B150054213	69	70	70	69	75	45	42	44	42	44	70	82	65	77	43	46	44	42	91
15	B150054214	67	51	60	59	56	40	29	41	32	43	58	71	72	64	43	42	44	42	96
16	B150054215	63	51	63	76	50	45	42	37	35	44	60	72	77	63	40	41	45	44	93
17	B150054216	56	55	65	75	60	46	43	41	43	43	63	76	73	68	38	40	45	43	91
18	B150054217	69	68	64	71	57	47	44	39	38	41	66	76	76	75	43	42	37	35	91
19	B150054218	69	70	56	66	67	40	38	43	36	40	50	78	68	50	40	35	39	37	79
20	B150054219	56	51	51	60	49	40	29	40	37	38	45	62	59	53	41	38	37	35	90
21	B150054220	63	62	61	75	67	45	42	40	40	45	63	75	57	65	38	40	41	39	96
22	B150054221	71	70	66	72	48	43	40	42	37	40	62	77	66	66	43	40	41	39	90
23	B150054222	46	45	42	40	48	47	44	40	36	35	46	49	49	45	35	39	39	37	73
24	B150054223	74	61	66	73	68	41	38	41	38	44	61	69	64	51	39	39	45	44	96
25	B150054224	73	59	58	70	79	44	41	42	41	42	56	72	64	60	42	43	39	37	96
26	B150054225	55	46	53	70	54	41	38	42	39	42	50	61	51	51	43	35	44	42	96
27	B150054226	72	67	68	62	76	45	42	40	35	41	54	71	54	47	40	41	44	42	90
28	B150054227	57	54	58	60	54	47	45	39	40	45	55	66	53	48	41	42	44	42	96
29	B150054228	73	71	69	71	66	43	40	40	39	43	60	75	59	66	44	43	43	41	95
30	B150054229	71	73	71	76	78	43	40	40	38	41	56	75	67	63	41	42	43	41	92

Results : Generated analysis report

	HPC	AIR	DA	Elec_1	Elec_2
count	311.000000	311.000000	311.000000	311.000000	311.000000
mean	65.491961	62.636656	65.138264	63.935691	65.295820
std	9.410997	9.214635	9.248026	11.461396	10.098353
min	35.000000	36.000000	23.000000	0.000000	26.000000
25%	59.000000	57.000000	59.500000	58.000000	60.000000
50%	67.000000	62.000000	67.000000	66.000000	67.000000
75%	72.500000	70.000000	72.000000	71.000000	73.000000
max	86.000000	84.000000	85.000000	87.000000	84.000000