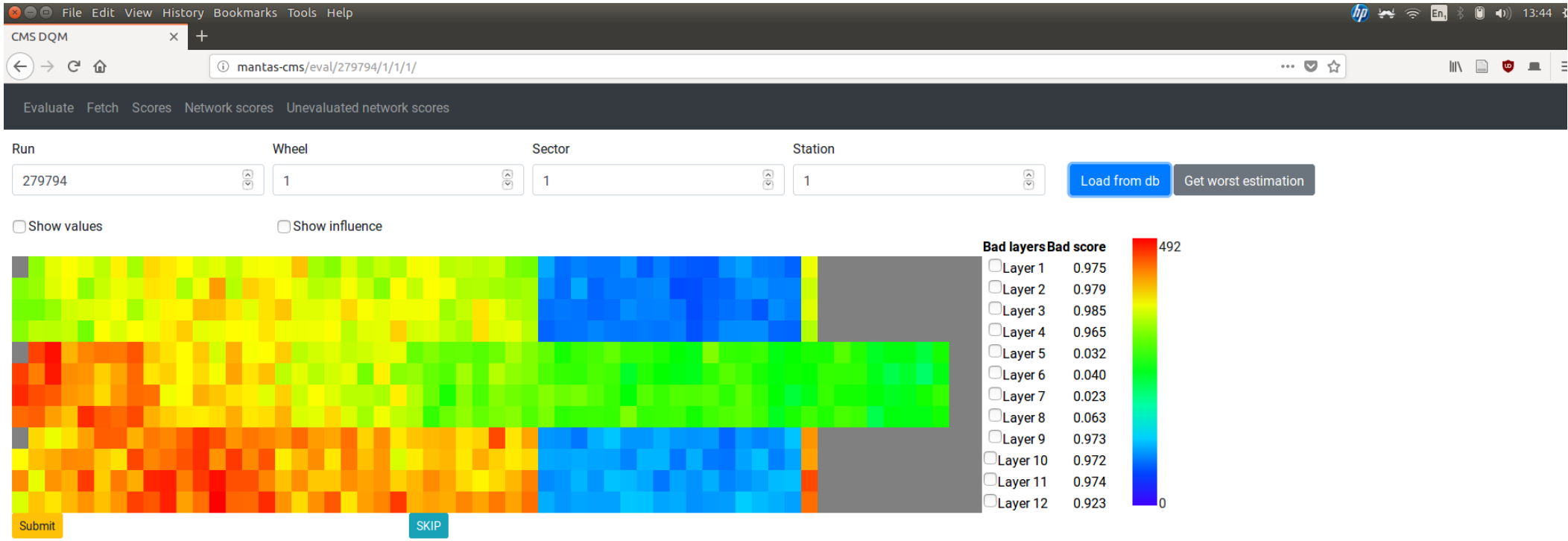
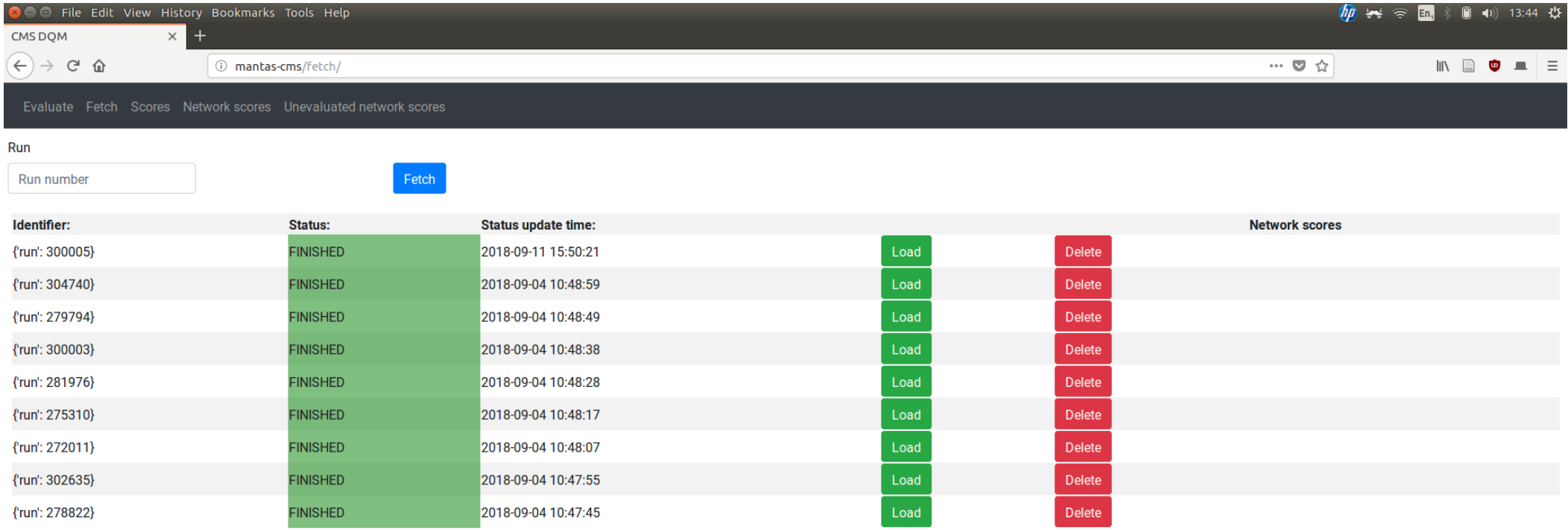
CMS-DQM + Active learning

- https://cmsweb.cern.ch/dqm/online/jsonfairy/archive/**279794**/Global/Online/ALL/DT/01-Digi/Wheel**1**/Sector**2**/Station**3**/OccupancyAllHits_perCh_W**1**_St**3**_Sec**2**
- (12*3+14) * 5 = 250 request per Run
- Written in Python 3.6 , async fetching in background thread
- Processes by neural network
  - Removed negatives
  - Each row scaled to 1
  - Each row resized to 47
  - Evaluated with network
- Saved to Mongodb 4.0
- Active learning GUI with Flask + JS/HTML/CSS

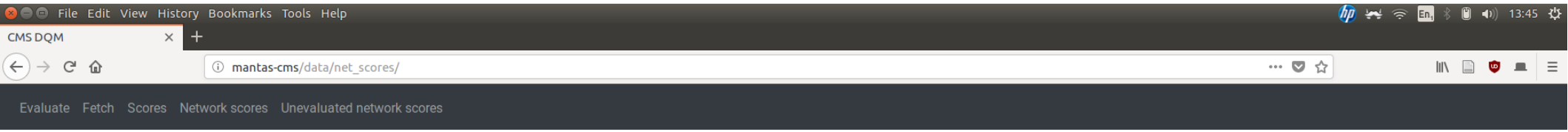
Active learning page



Loading data page



Statistics



Identifier:	Params:	Network score:	Certainty score:	Evaluated bad layers	
{'run': 279794}	{'wheel': 0, 'station': 4, 'sector': 14}	| 0.952| 0.947| 0.305| 0.497| -1.000| -1.000| -1.000| -1.000| 0.990| 0.989| 0.912| 0.722|	0.00321	Skipped	Load
{'run': 278822}	{'wheel': -1, 'station': 3, 'sector': 1}	| 0.002| 0.002| 0.012| 0.005| 0.504| 0.999| 0.999| 1.000| 0.002| 0.003| 0.000| 0.016|	0.00367	[5, 6, 7, 8]	Load
{'run': 302635}	{'wheel': -2, 'station': 1, 'sector': 1}	| 0.000| 0.000| 0.504| 0.000| 0.349| 0.043| 0.009| 0.001| 0.001| 0.001| 0.003| 0.002|	0.00432	-	Load
{'run': 281976}	{'wheel': 0, 'station': 2, 'sector': 9}	| 0.015| 0.495| 0.238| 0.003| 0.000| 0.011| 0.004| 0.002| 0.002| 0.000| 0.001| 0.008|	0.00550	-	Load
{'run': 281976}	{'wheel': 0, 'station': 3, 'sector': 10}	| 0.013| 0.003| 0.006| 0.002| 0.102| 0.351| 0.745| 0.494| 0.009| 0.027| 0.015| 0.053|	0.00633	-	Load
{'run': 302635}	{'wheel': -1, 'station': 2, 'sector': 10}	| 0.000| 0.000| 0.003| 0.000| 0.001| 0.013| 0.507| 0.007| 0.015| 0.003| 0.000| 0.000|	0.00713	-	Load
{'run': 302635}	{'wheel': 1, 'station': 4, 'sector': 14}	| 0.001| 0.000| 0.000| 0.001| -1.000| -1.000| -1.000| -1.000| 0.303| 0.005| 0.513| 0.492|	0.00824	-	Load
{'run': 302635}	{'wheel': 2, 'station': 3, 'sector': 1}	| 0.154| 0.018| 0.000| 0.068| 1.000| 1.000| 1.000| 1.000| 0.000| 0.866| 0.509| 0.000|	0.00899	-	Load
{'run': 278822}	{'wheel': 2, 'station': 4, 'sector': 9}	| 0.000| 0.008| 0.002| 0.004| -1.000| -1.000| -1.000| -1.000| 0.018| 0.511| 0.002| 0.000|	0.01138	-	Load
{'run': 302635}	{'wheel': -1, 'station': 3, 'sector': 6}	| 0.097| 0.064| 0.513| 0.339| 0.000| 0.000| 0.000| 0.000| 0.001| 0.001| 0.001| 0.004|	0.01268	-	Load
{'run': 302635}	{'wheel': -2, 'station': 4, 'sector': 10}	| 0.098| 0.001| 0.487| 0.003| -1.000| -1.000| -1.000| -1.000| 0.000| 0.000| 0.000| 0.016|	0.01277	-	Load
{'run': 279794}	{'wheel': 2, 'station': 3, 'sector': 5}	| 0.841| 0.000| 0.001| 0.000| 0.025| 0.485| 0.039| 0.142| 0.000| 0.000| 0.000| 0.004|	0.01516	-	Load
{'run': 278822}	{'wheel': 1, 'station': 1, 'sector': 7}	| 0.000| 0.000| 0.000| 0.000| 0.004| 0.273| 0.001| 0.006| 0.360| 0.517| 0.893| 0.736|	0.01734	-	Load
{'run': 272011}	{'wheel': 1, 'station': 4, 'sector': 6}	| 0.000| 0.001| 0.000| 0.001| -1.000| -1.000| -1.000| -1.000| 0.715| 0.927| 0.897| 0.481|	0.01851	-	Load
{'run': 304740}	{'wheel': -2, 'station': 1, 'sector': 12}	| 0.481| 0.104| 0.000| 0.027| 0.002| 0.006| 1.000| 0.003| 0.001| 0.001| 0.001| 0.001|	0.01865	-	Load
{'run': 304740}	{'wheel': 2, 'station': 4, 'sector': 4}	| 0.519| 0.342| 0.551| 0.068| -1.000| -1.000| -1.000| -1.000| 0.332| 0.201| 0.155| 0.045|	0.01928	-	Load
{'run': 302635}	{'wheel': 0, 'station': 3, 'sector': 12}	| 0.008| 0.480| 0.278| 0.020| 0.728| 0.068| 0.460| 0.199| 0.629| 0.804| 0.653| 0.027|	0.01965	-	Load
{'run': 302635}	{'wheel': -1, 'station': 4, 'sector': 9}	| 0.013| 0.520| 0.010| 0.019| -1.000| -1.000| -1.000| -1.000| 0.000| 0.066| 0.003| 0.004|	0.02000	-	Load
{'run': 302635}	{'wheel': 1, 'station': 4, 'sector': 10}	| 0.000| 0.000| 0.000| 0.000| -1.000| -1.000| -1.000| -1.000| 0.014| 0.194| 0.524| 0.039|	0.02446	-	Load
{'run': 278822}	{'wheel': 1, 'station': 2, 'sector': 8}	| 0.000| 0.000| 0.001| 0.001| 0.136| 0.525| 0.010| 0.023| 0.008| 0.007| 0.000| 0.029|	0.02545	-	Load

Saliency maps [not fully working]

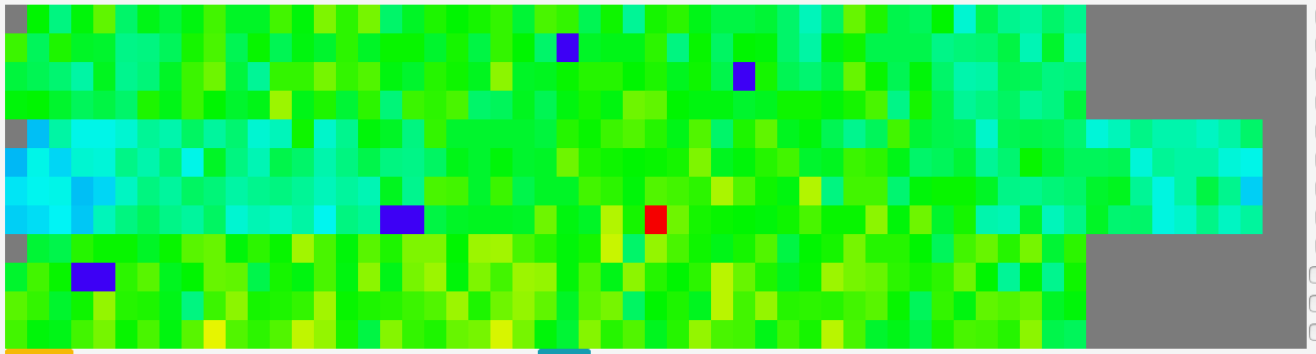
- Insight into neural network
- Steps:
  - After getting the neural network result, get gradients
  - Scale them to original size
  - Fit into matrix

Evaluate Fetch Scores Network scores Unevaluated network scores

Run	Wheel	Sector	Station
302635	-2	1	1

Load from db | Get worst estimation

Show values | Show influence



Bad layers	Bad score
Layer 1	0.002
Layer 2	0.003
Layer 3	0.001
Layer 4	0.001
Layer 5	0.001
Layer 6	0.009
Layer 7	0.043
Layer 8	0.349
Layer 9	0.000
Layer 10	0.504
Layer 11	0.000
Layer 12	0.000

Submit SKIP

Evaluate Fetch Scores Network scores Unevaluated network scores

Run	Wheel	Sector	Station
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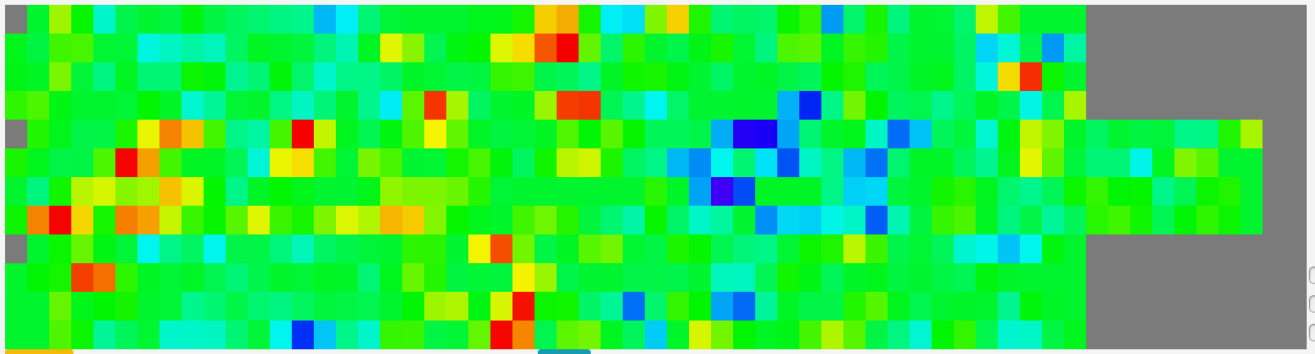

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Layer 7	0.043
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Layer 9	0.000
Layer 10	0.504
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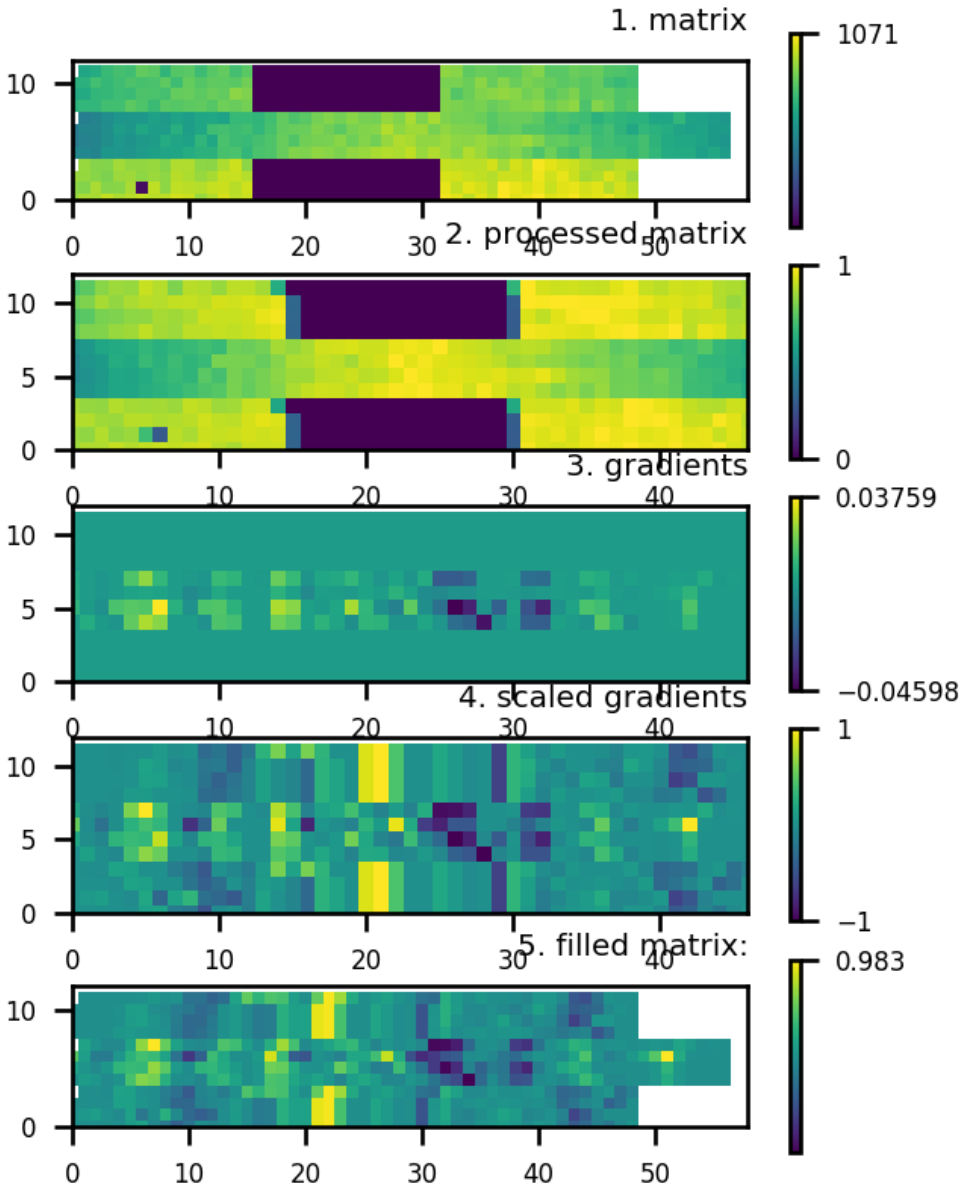
Layer 12	0.000

Submit SKIP

Saliency map steps



Todo

- Somehow fix saliency maps
- Export / Import
- More statistics
- Reevaluate button
- Paging in statistics pages
- Web design / UX fixes
- Deploying