data cleaning principles

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kbroman.org/Talk_DataCleaning

Tidy data are all alike,
but every messy dataset
is messy in its own way.

– Hadley Wickham

If I clean up [Medicare] data ...
does any of the knowledge I gain ...
apply to the processing of RNA-seq data?

– Roger Peng

Data Mishaps Night

Join us for the first inaugural Data Mishaps Night! We will feature a lineup of data mistake stories with a focus on the human aspect of data work and lessons learned the hard way.

Caitlin Hudon & Laura Ellis

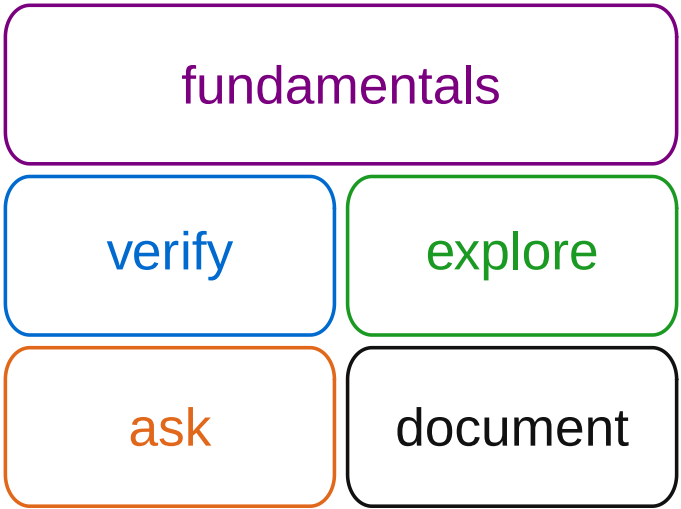
dataMishapsNight.com

Data cleaning

- tedious
- embarrassing
- needs context
- doesn’t feel like progress

Data cleaning

- tedious
- embarrassing
- needs context
- doesn't feel like progress
- requires creativity
- requires coding prowess
- source of most problems


fundamentals
verify
explore
ask
document

fundamentals

1. Don’t clean data when you’re tired or hungry.

(paraphrasing Ghazal Gulati)

fundamentals

2. Don’t trust anyone (even yourself)

fundamentals

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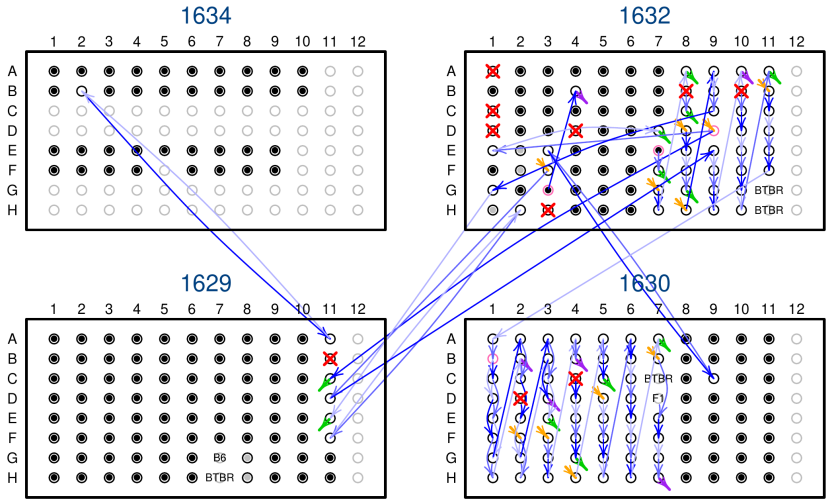
“my motto is ‘trust no one’
...except maybe @kwbroman?”

– Jenny Bryan

fundamentals

3. Think about what might have gone wrong and how it might be revealed



fundamentals

4. Use care in merging

	A	B	C	D	E	F	G
1	id	glucose.0	glucose.5	glucose.15	glucose.30	insulin.0	insulin.5
2	DO−221	145.742786	206.452638	216.640608	299.55501	0.74455	2.0264
3	DO−222						
4	DO−223						
5	DO−224						
6	DO−225						
7	DO−226						
8	DO−227						
9	DO−228						
10	DO−229						
11	DO−230						

	A	B	C	D	E	F	G
1	id	glucose.0	insulin.0	glucose.5	insulin.5	glucose.15	insulin.15
2	DO−321	66.839405	0.04	246.685995	0.04	305.26214	0.04
3	DO−322	98.12509	0.51185	246.25574	1.4062	301.8201	2.828
4	DO−323	94.68305	1.7812	448.1068	1.0248	521.61894	1.02725
5	DO−324	121.051535	0.0882	407.355505	0.63475	470.541525	0.8195
6	DO−325	122.95695	0.19155	298.193665	0.6467	323.148455	0.40515
7	DO−326	201.447755	0.7454	386.51887	0.6081	654.99799	1.07225
8	DO−327	130.025425	0.0509	477.302675	0.166	610.49733	0.4842
9	DO−328	143.60919	0.23435	438.88705	0.70505	406.249135	0.2498
10	DO−329	125.29262	0.04	543.74634	1.7366	520.205245	0.8498
11	DO−330	135.61874	0.91275	393.03416	3.73095	454.62209	1.7325

fundamentals

5. Dates & categories suck

Principle:

a fundamental truth that guides our thinking

fundamentals

5. Dates & categories suck

verify

6. Check that distinct things are distinct

verify

7. Check that matching things match

verify

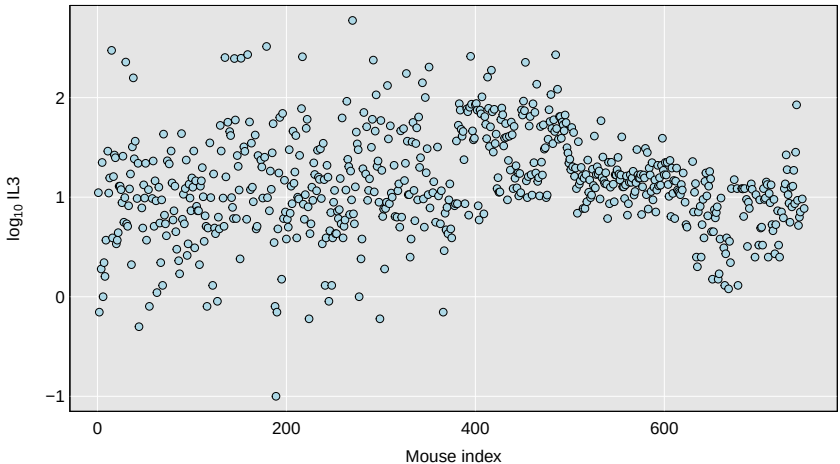
8. Check calculations

verify

9. Look for other instances of a problem

explore

10. Make lots of plots



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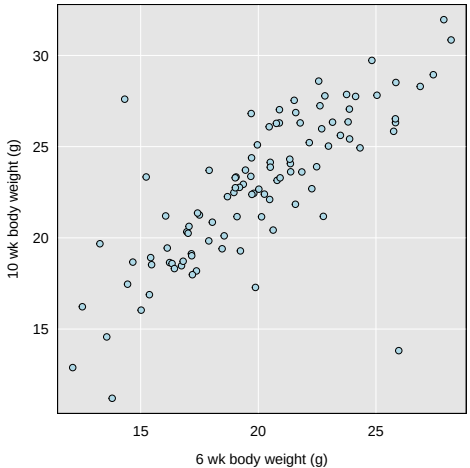

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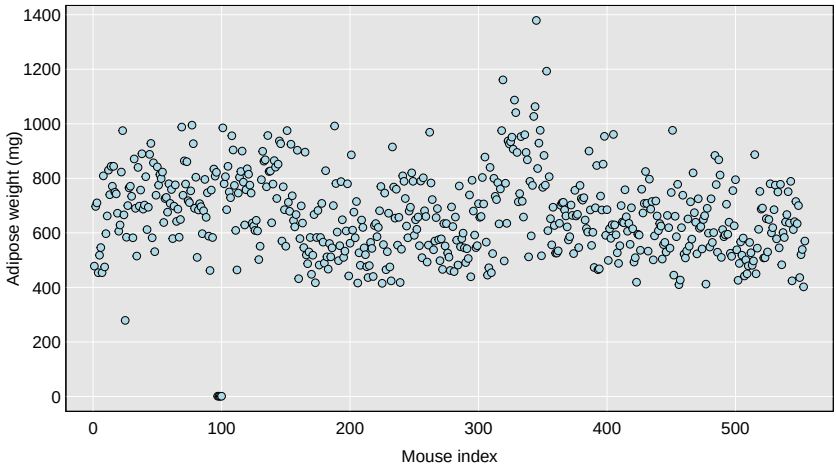

explore

10. Make lots of plots

	A	B	C	D
1	id	Rt Kidney wt	Rt Adipose wt	Liver wt
2	DO−121	294	757	930
3	DO−122	296	583	439
4	DO−123	NA	834	527
5	DO−124	513	808	600
6	DO−125	381	780	493
7	DO−126	225	1.066	355
8	DO−127	262	1.03	512
9	DO−128	231	0.687	497
10	DO−129	263	0.932	580
11	DO−130	266	985	906

explore

11. Look at missing value patterns

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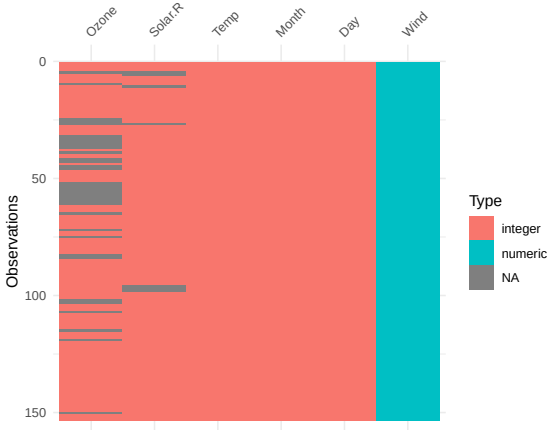

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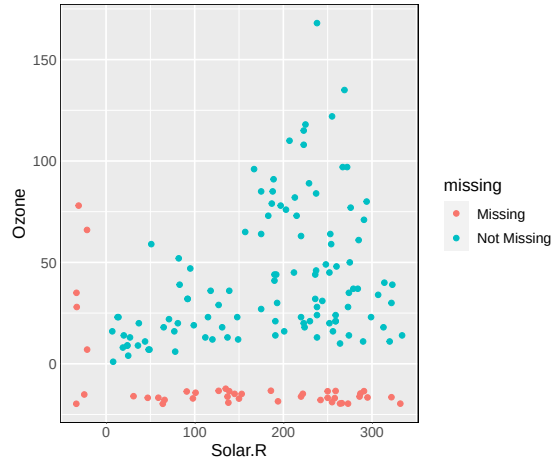
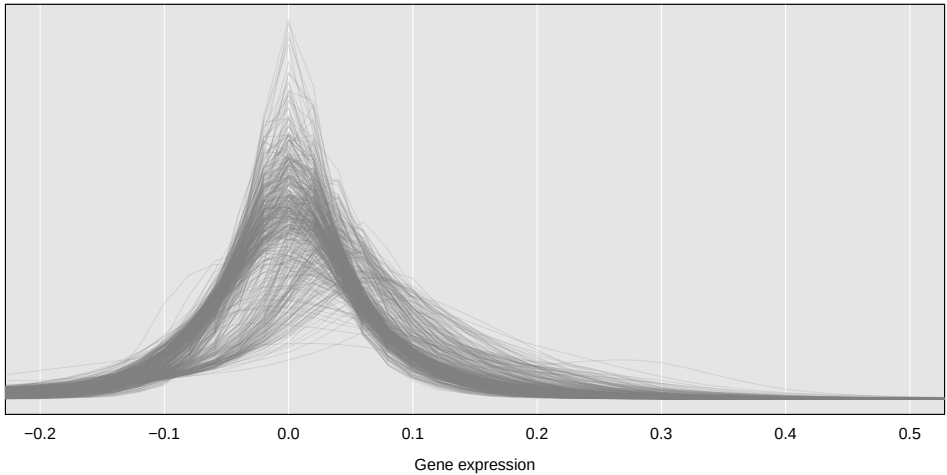


explore

12. With massive data,
make more plots not fewer



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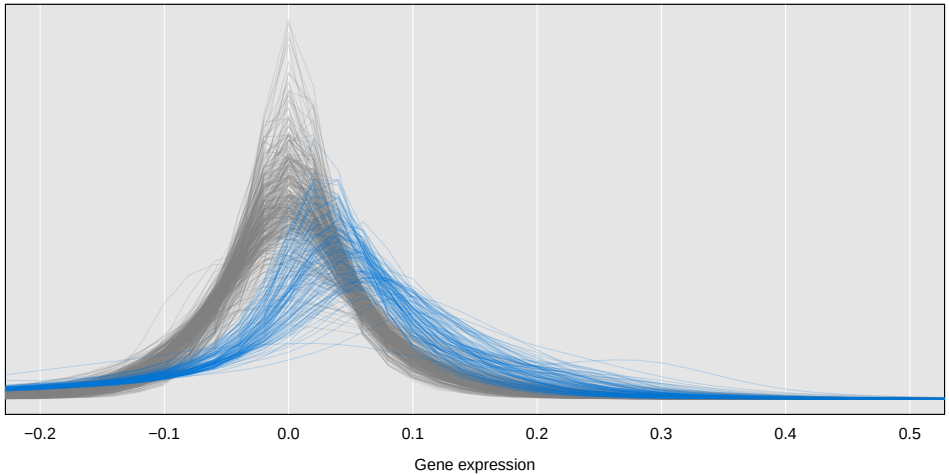

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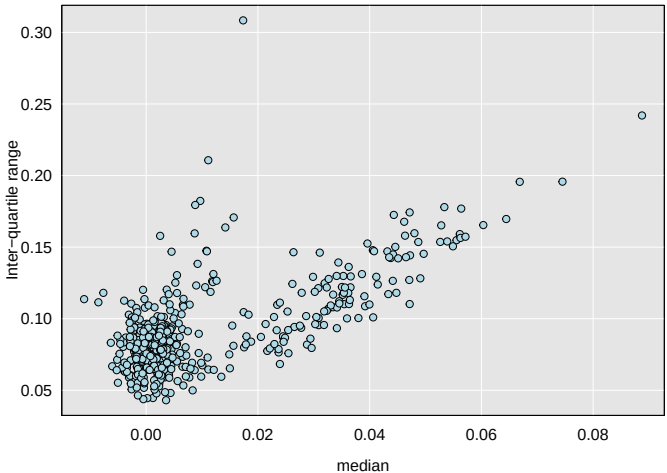

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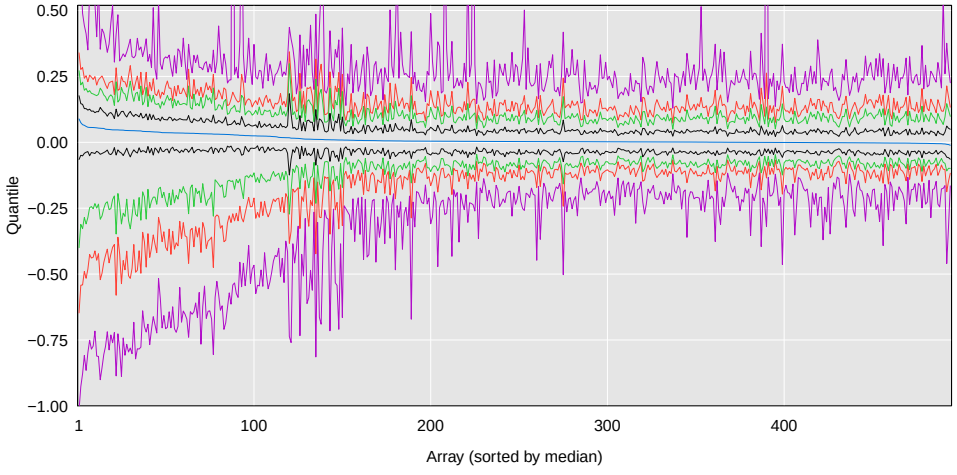
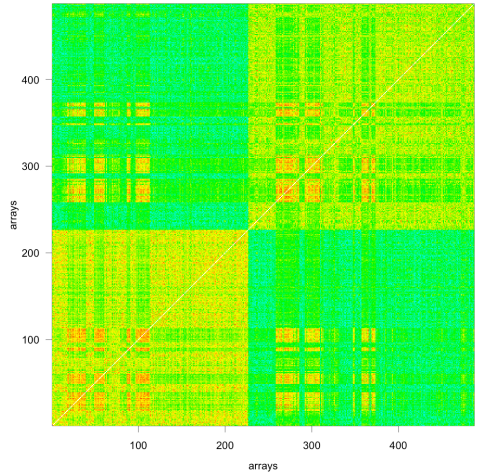


explore

13. Follow up all artifacts



kbroman.org/blog/2012/04/25/microarrays-suck

ask

14. Ask questions
15. Ask for the primary data
16. Ask for metadata
17. Ask why data are missing

document

18. Create checklists & pipelines
19. Document not just what but why
20. Expect to recheck

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verify

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10. Make lots of plots
11. Look at missing value patterns
12. With big data make more plots
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