Week 1-2 Human-level Performance, Avoidable Bias

笔记本: DL 3 - Structuring ML Projects
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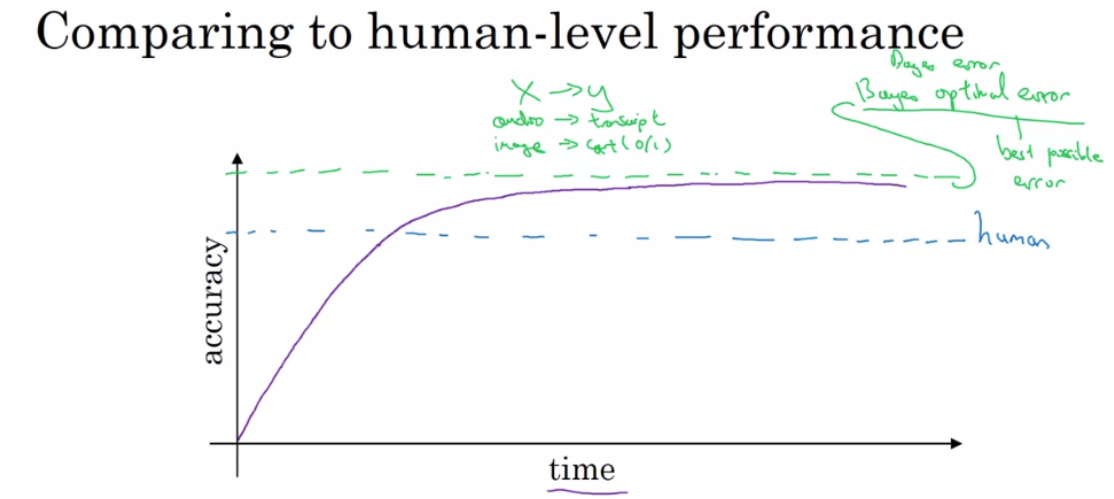
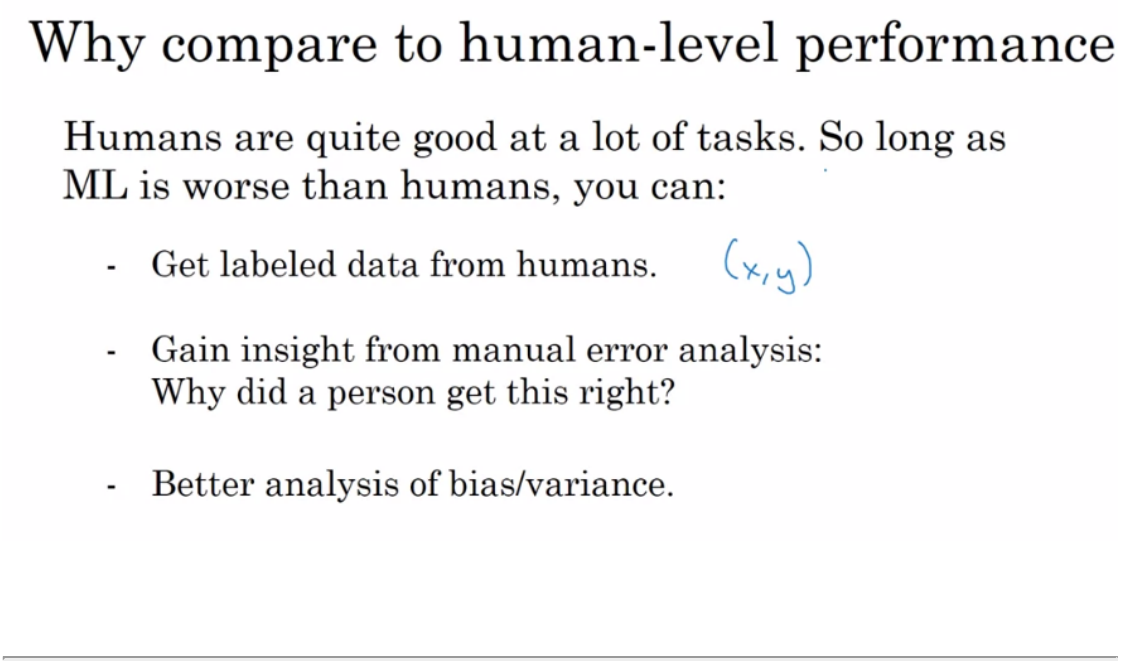
Bayes Optimal Error

Bayes error rate is the lowest possible error rate for any classifier of a random outcome (into, for example, one of two categories) and is analogous to the irreducible error.

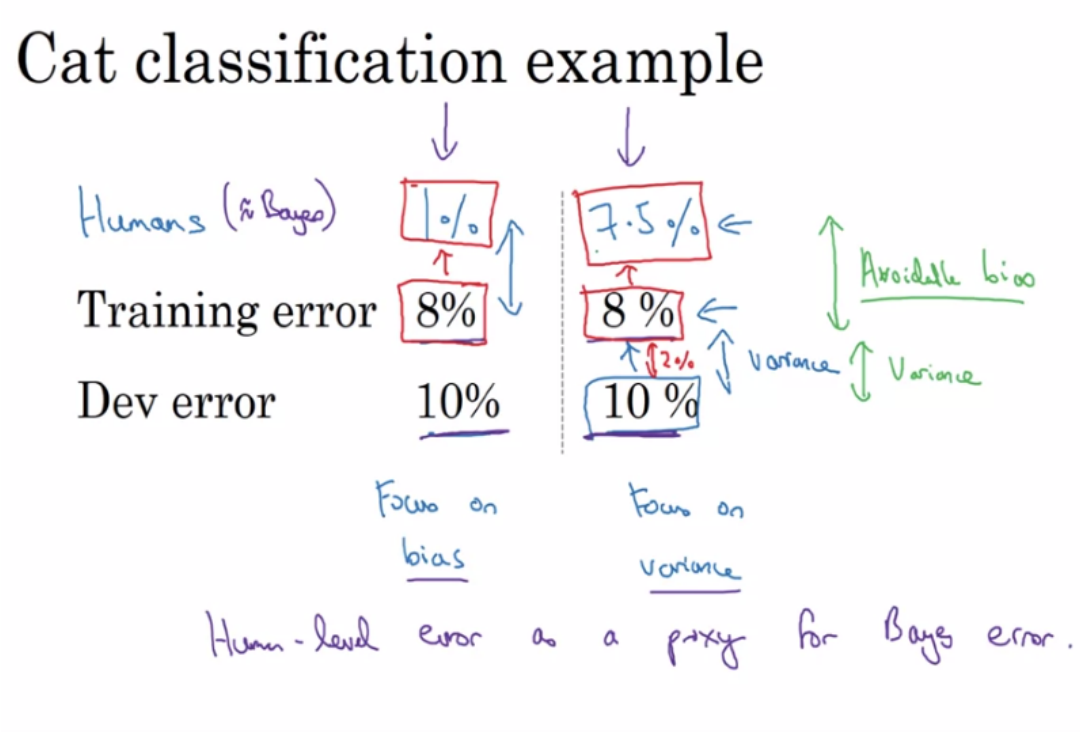


And it sometimes slows down after you surpass human level performance.

One reason is that human level performance is for many tasks not that far from Bayes' optimal error. But the second reason is that so long as your performance is worse than human level performance, then there are actually **certain tools you could use to improve performance** that are **harder to use** once you've surpassed human level performance.



Avoidbale bias



but sometimes you don't actually want to do too well and knowing what human level performance is, can tell you exactly how well but not too well you want your algorithm to do on the training set.

Understanding Human-level Performance

Human-level error as a proxy for Bayes error

Medical image classification example:

Suppose:

(a) Typical human ..... 3 % error

(b) Typical doctor ..... 1 % error

(c) Experienced doctor ..... 0.7 % error

→ (d) Team of experienced doctors .. 0.5 % error ←

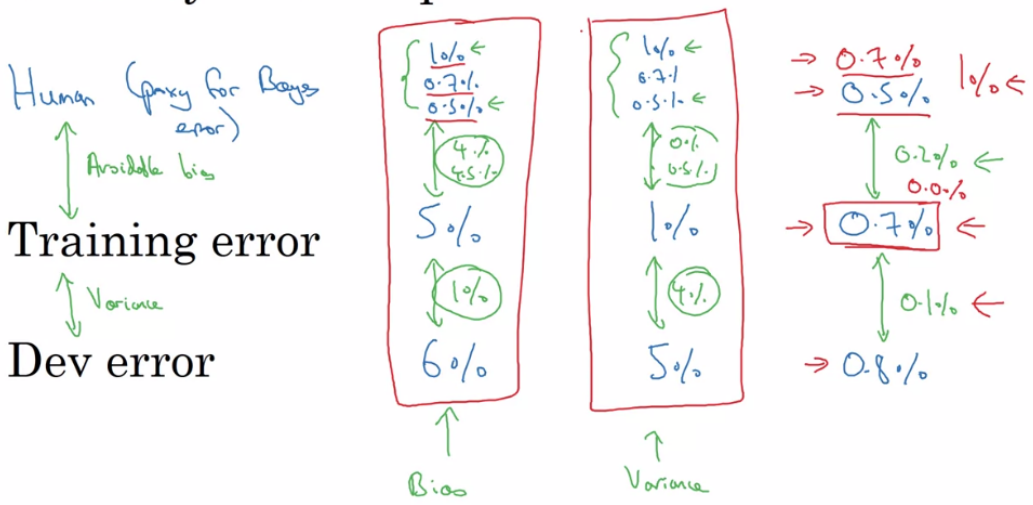
Bayes error ≤ 0.5%

What is "human-level" error?

and maybe surpassing a single radiologist, a single doctor's performance might mean the system is good enough to deploy in some context.

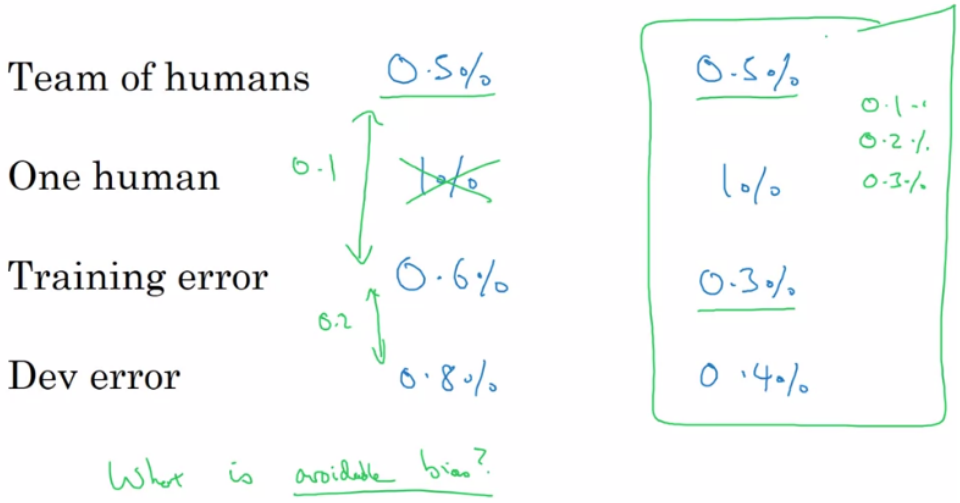
So maybe the takeaway from this is to be clear about what your purpose is in defining the term human-level error.

Error analysis example



Surpassing

Surpassing human-level performance



What is avoidable bias?

Unclear where to further work on

Problems where ML significantly surpasses human-level performance

- Online advertising
- Product recommendations
- Logistics (predicting transit time)
- Loan approvals

Structural data
Not natural perception
Lots of data

- Speech recognition
- Some image recognition
- Medical
  - ECG, Skin cancer, ...

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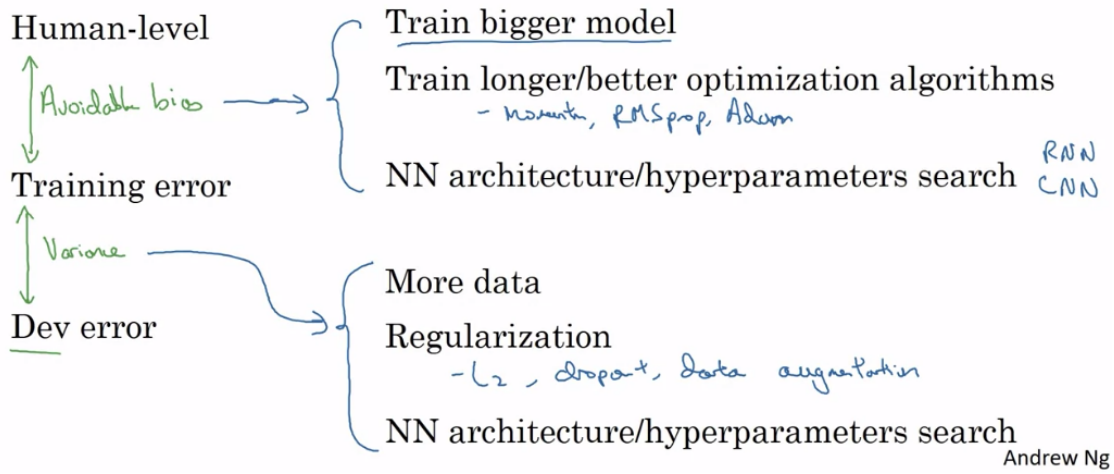
What to do:

Reducing (avoidable) bias and variance



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