

Communicating your analysis with clinicians and managers

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Machine Learning in Healthcare

- Machine Learning (ML) increasingly important in enabling critical business decisions in healthcare
- Text Mining & Natural Language Processing quite popular
 - NIHR [Improving Care by Using Patient Feedback](#)
 - HDR UK [National Text Analytics Resource](#)
 - [Our very own project](#) ('develop' branch up to date)
- ML often seen as 'black box'

How can we increase the confidence of non-specialist top management in ML?

Rapid intro to Machine Learning



<https://playgro.com/>

Explaining complex ML models to the lay audience

Explaining Random Forest...

Explaining complex ML models to the lay audience



Do I *really* need to explain Random Forest?

Explaining complex ML models to the lay audience



Do I *really* need to explain Random Forest?

Let's better start with simple, intuitive Decision Trees...



Can I play tennis tomorrow?

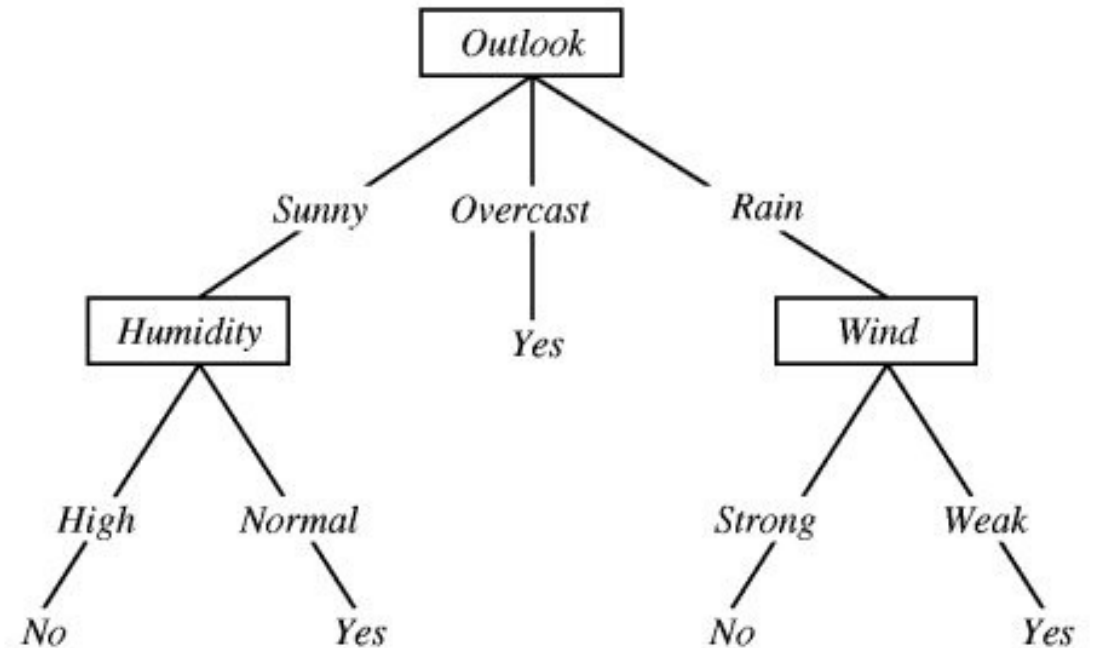


Image from: <http://science.slc.edu/~jmarshall/courses/2005/fall/cs151/lectures/decision-trees/>

Explaining complex ML models to the lay audience



Do I *really* need to explain Random Forest?

Let's better start with simple,
intuitive Decision Trees...
... and let's leave it at that!



Can I play tennis tomorrow?

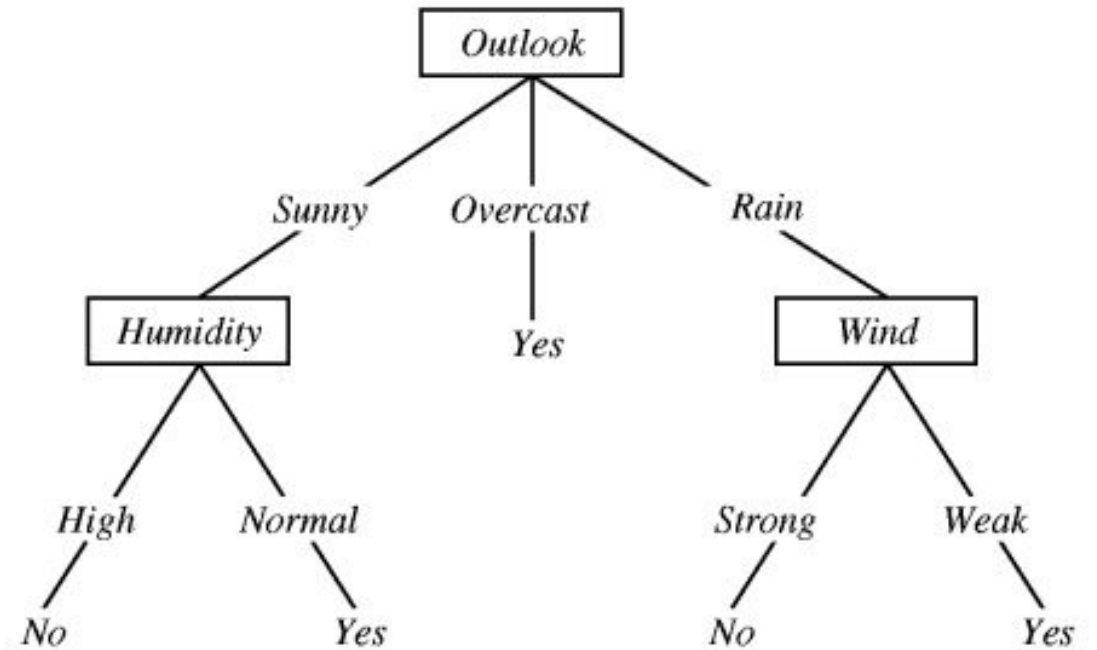
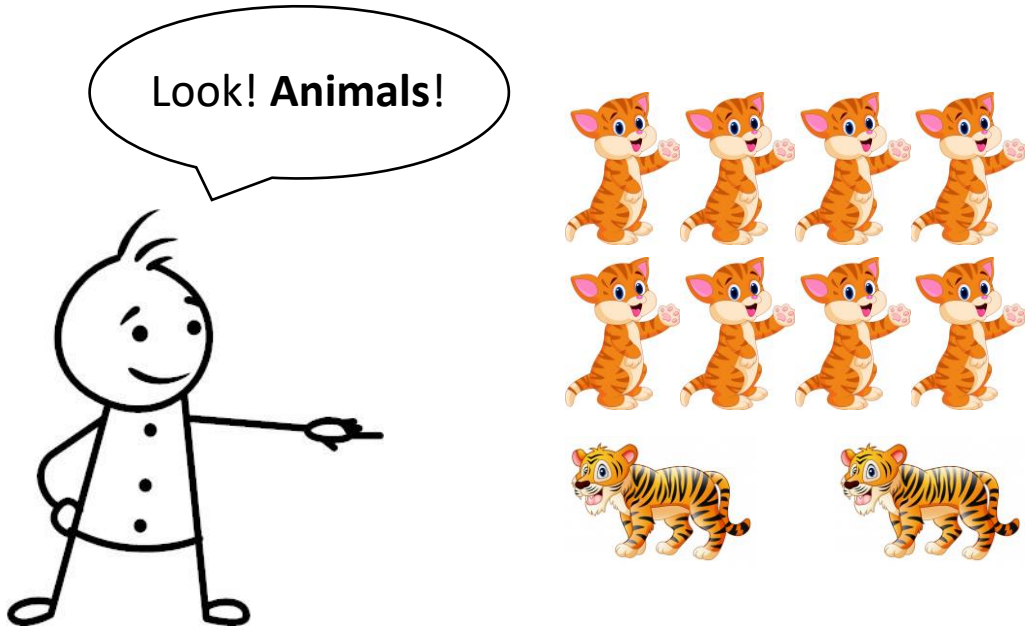


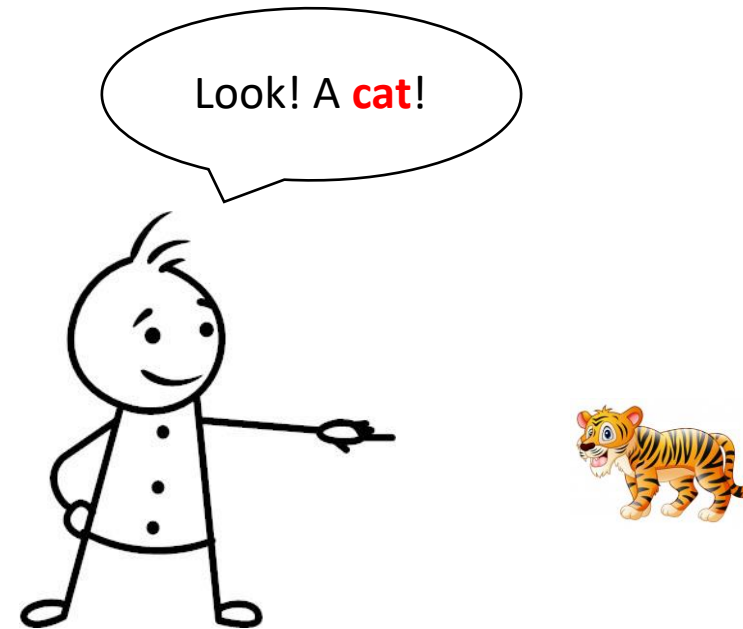
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Class balancing

Training phase

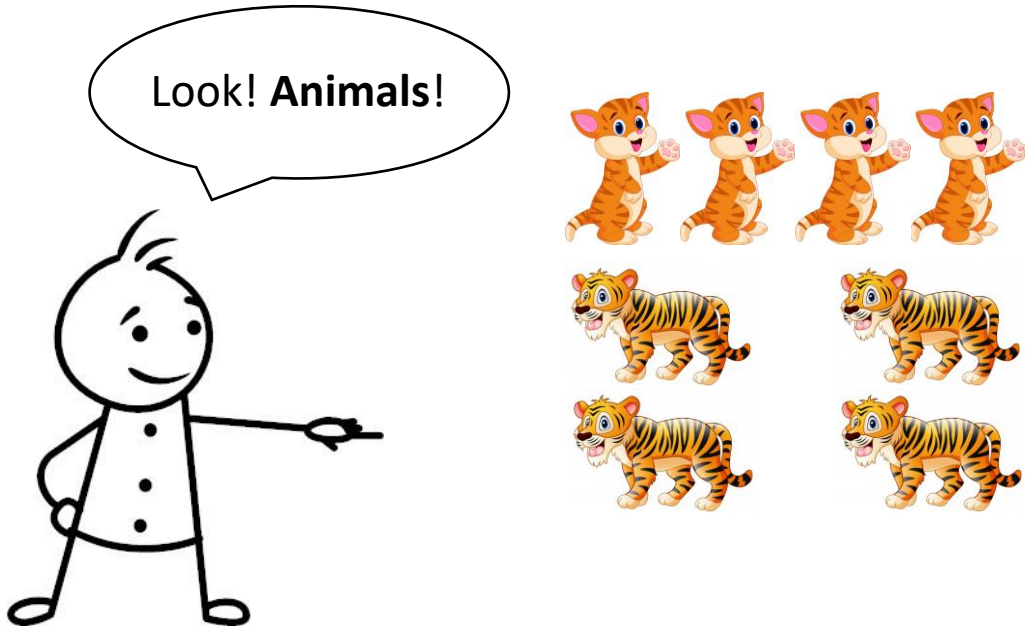


Testing phase



Class balancing

Training phase

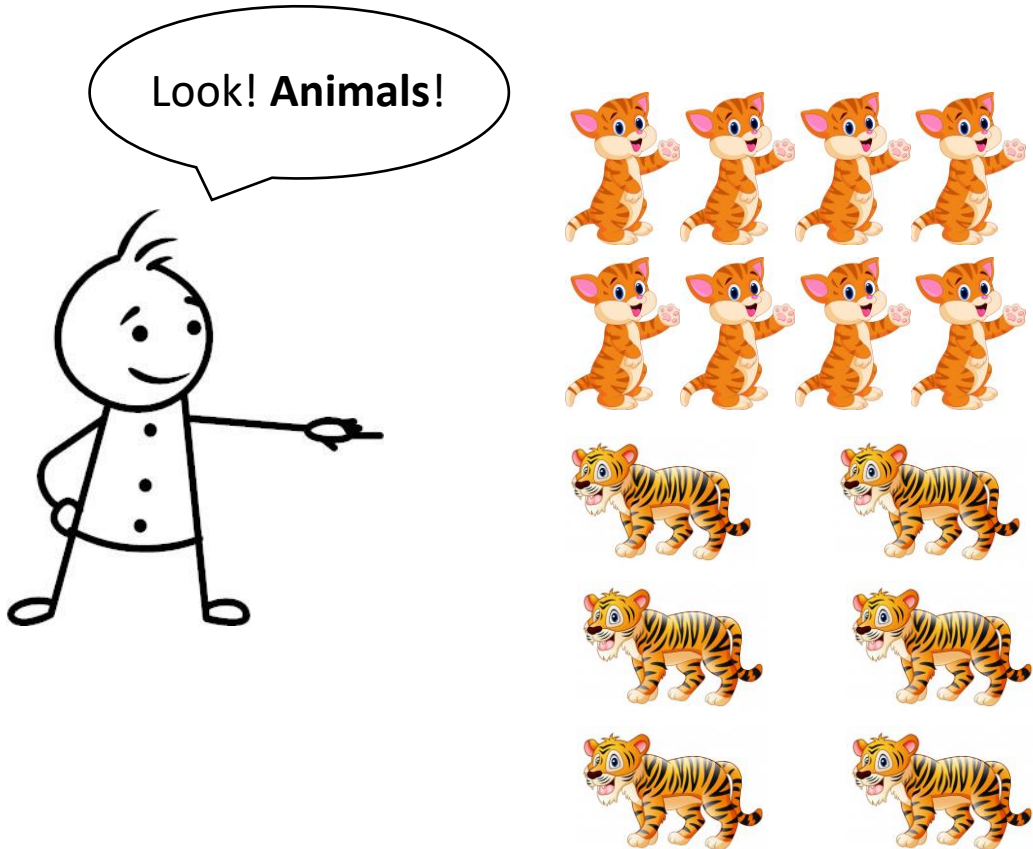


Testing phase



Class balancing

Training phase

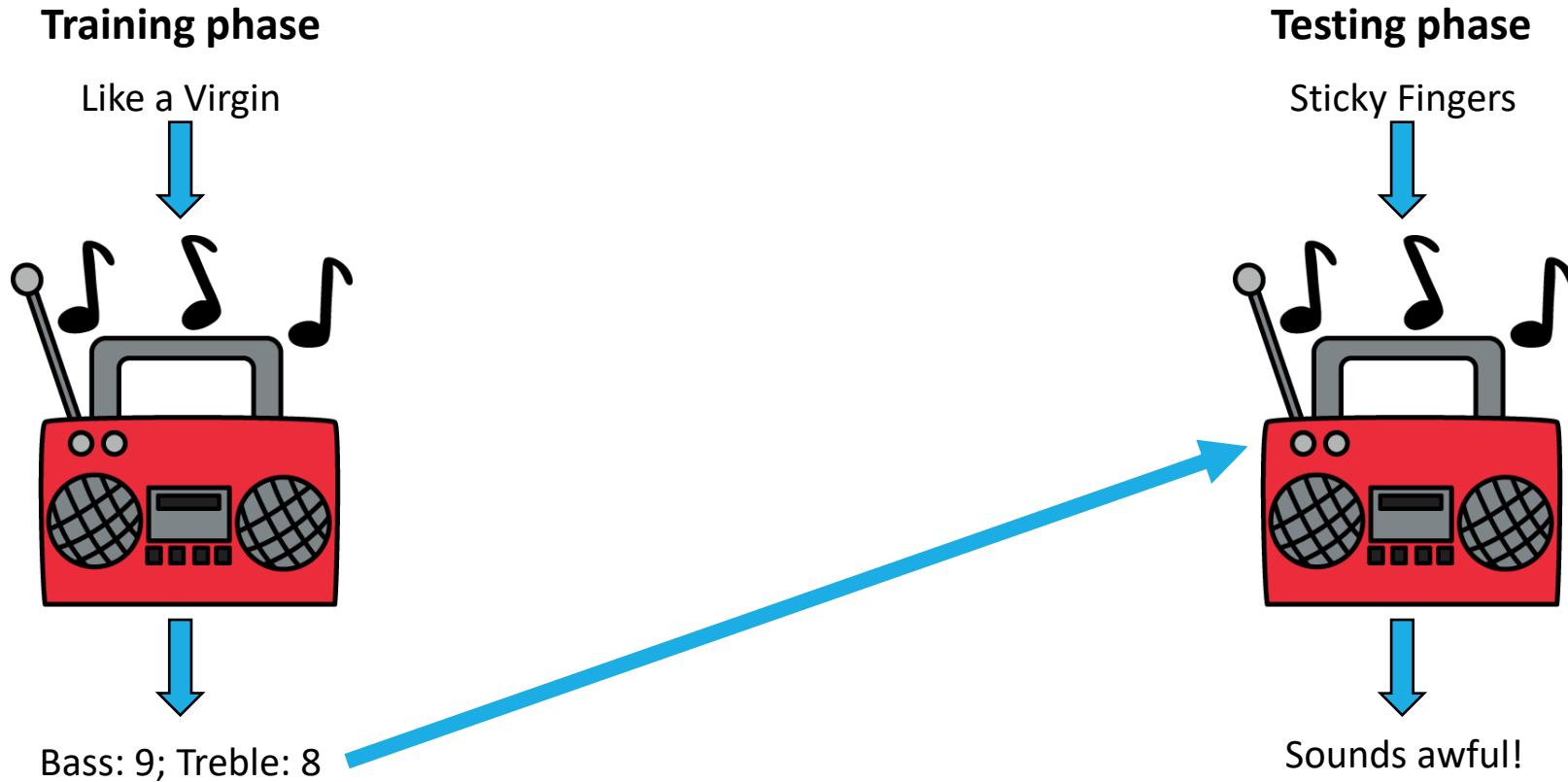


Testing phase



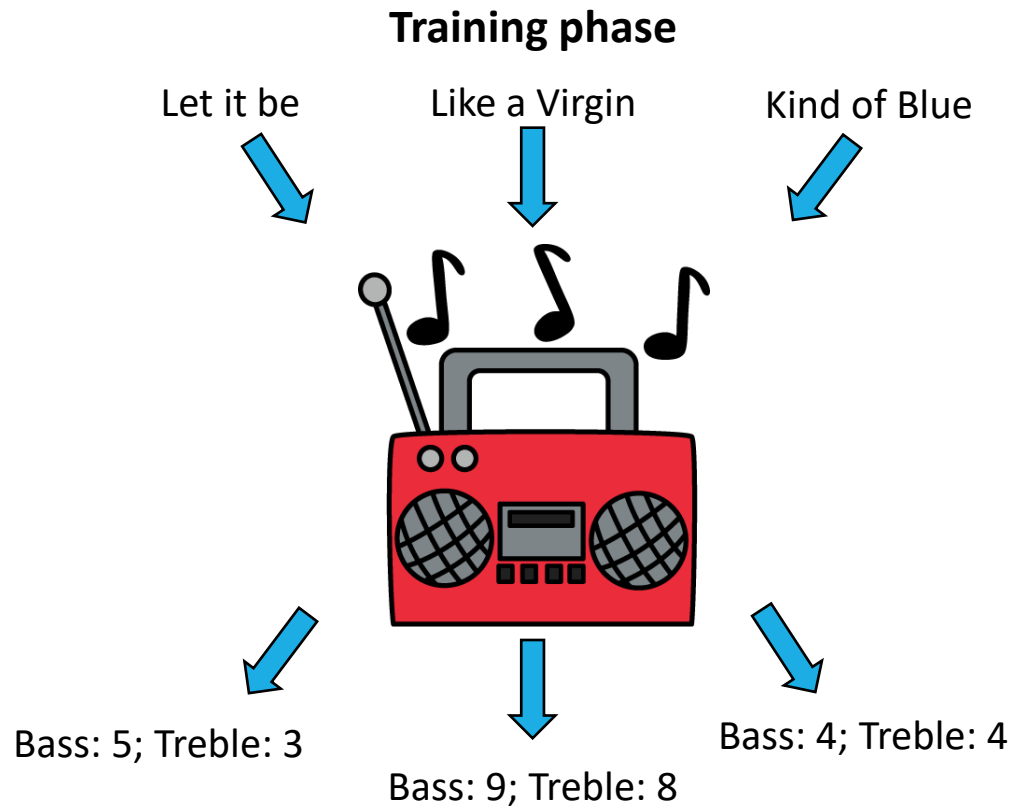
Hyperparameter tuning

The Challenge: find optimal bass and treble settings for all of my albums!



Hyperparameter tuning

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Hyperparameter tuning

The Challenge: find optimal bass and treble settings for all of my albums!

Training phase

Let it be

Like a Virgin

Kind of Blue



Bass: 5; Treble: 3

Bass: 9; Treble: 8

Bass: 4; Treble: 4

Optimal
settings
somewhere
'in the middle'

Testing phase

Sticky Fingers



Sounds great!

Other examples

Which type of petrol (**hyperparameter**) makes my car (**model**) run more efficiently (**optimization task**)?

Which builder (**model**), and using which tool/combination of tools (**hyperparameters**), will build me the perfect loft (**optimization task**)?

Involve top management in modelling process

Cost-sensitive Learning

	fraudulent	legitimate
refuse	\$20	−\$20
approve	− x	$0.02x$

Elkan (2001). *Proceedings of the Seventeenth IJCAI*.
At: <https://cseweb.ucsd.edu/~elkan/rescale.pdf>

Recommendations

- Don't talk about models and methods in detail- it's not necessary
- The point is for top management to see the value of ML in decision-making
- Use language that is relevant to the audience
- Help your audience by using examples from everyday life they can understand/identify with
- Seek ways to more actively involve top management in the model-building process

Thank you!

Questions?

CDU Data Science Team Blog:

<https://cdu-data-science-team.github.io/team-blog/>