TUE Technische Universiteit Eindhoven University of Technology

Not-so-supervised learning of algorithms and academics

Veronika Cheplygina

@vcheplygina

Where innovation starts



epresentative

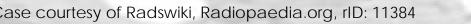
Representative & annotated data

Where are the abnormalities?



Case courtesy of A.Prof Frank Gaillard, Radiopaedia.org, rID: 8095

Training data we want

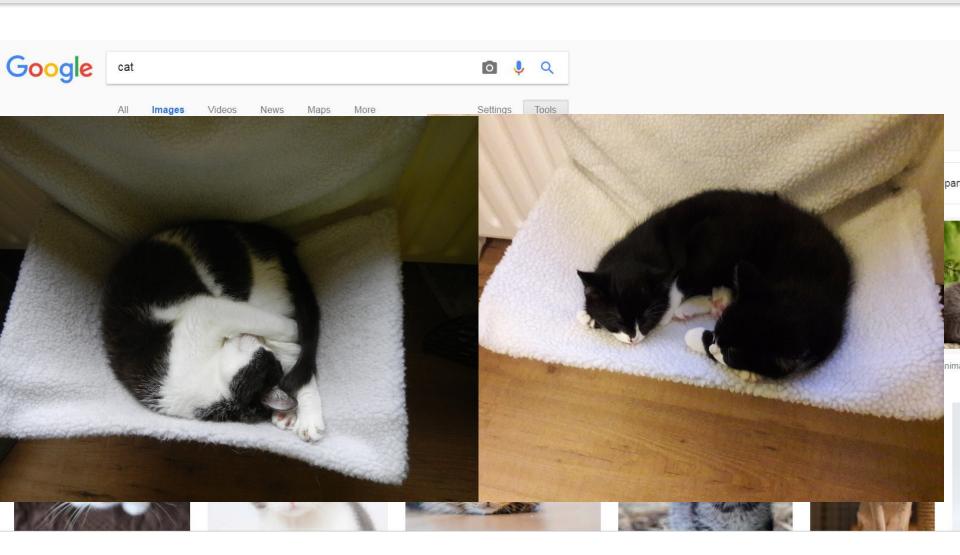


Training data we get

0 0

Case courtesy of Radswiki, Radiopaedia.org, rID: 11384

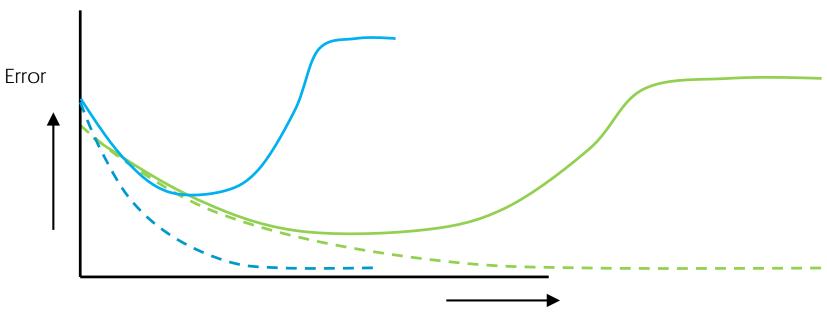
Training data not representative





Overfitting

Test error



Number of features / complexity of classifier

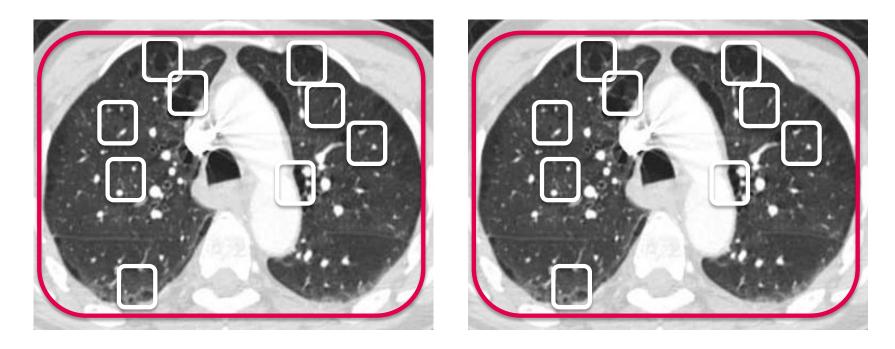
Solution 1: Multiple instance learning

Learn with global information – Carolyn is in both pictures



Solution 1: Multiple instance learning

Learn with global information

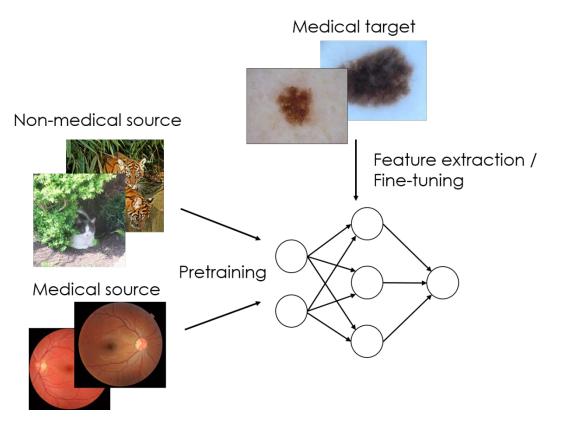


Cheplygina, V., Sorensen, L., Tax, D. M. J., Pedersen, J. H., Loog, M., & de Bruijne, M. (2014). Classification of COPD with multiple instance learning. In International Conference on Pattern Recognition (pp. 1508-1513).

Solution 2: Transfer learning

Not learning "from scratch"

... even from entirely different tasks



Cats or CAT scans: transfer learning from natural or medical image source datasets?

Veronika Cheplygina

https://www.sciencedirect.com/science/article/pii/S2468451118300527

Solution 2: Transfer learning

Not learning "from scratch"

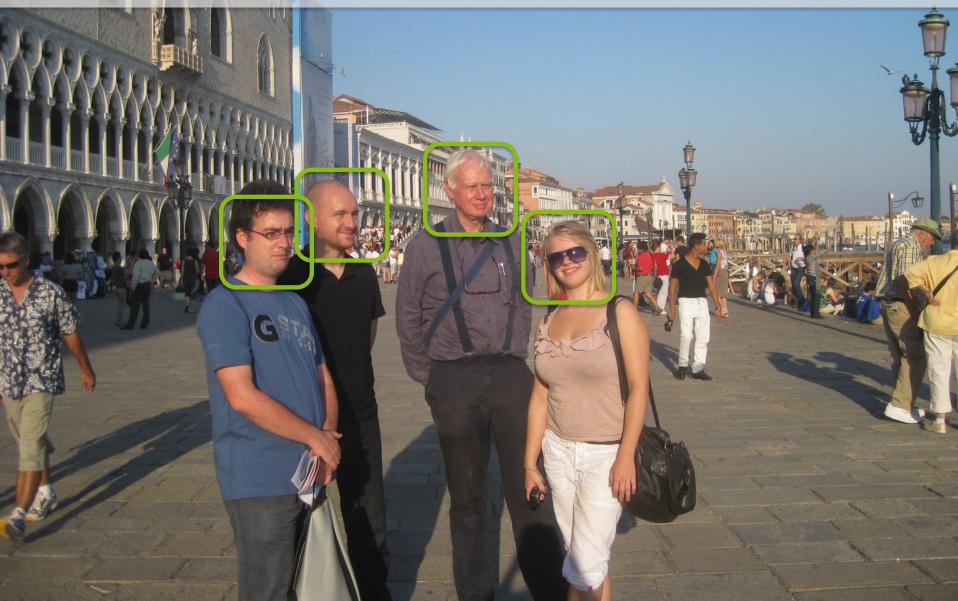
Not-so-supervised: a survey of semi-supervised, multi-instance, and transfer learning in medical image analysis

Veronika Cheplygina, Marleen de Bruijne, Josien P. W. Pluim

https://arxiv.org/abs/1804.06353

Solution 3: Crowdsourcing





Article

tvst

The Accuracy and Reliability of Crowdsource Annotations of Digital Retinal Images

Danny Mitry¹, Kris Zutis², Baljean Dhillon³, Tunde Peto¹, Shabina Hayat⁴, Kay-Tee Khaw⁵, James E. Morgan⁶, Wendy Moncur⁷, Emanuele Trucco², and Paul J. Foster¹ for the UK Biobank Eye and Vision Consortium

IEEE TRANSACTIONS ON MEDICAL IMAGING, VOL. 35, NO. 5, MAY 2016

AggNet: Deep Learning From Crowds for Mitosis Detection in Breast Cancer Histology Images

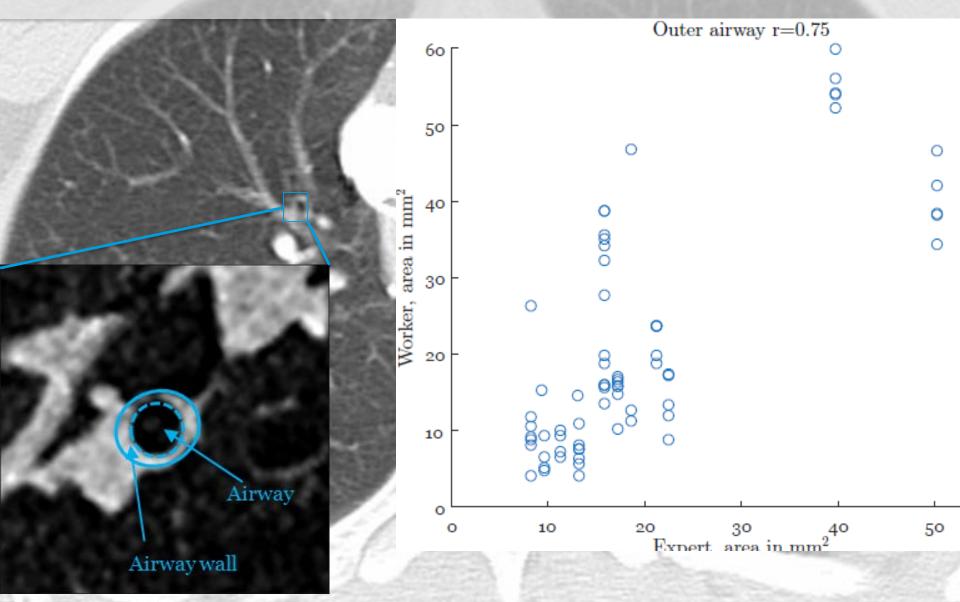
Shadi Albarqouni*, Student Member, IEEE, Christoph Baur, Felix Achilles, Student Member, IEEE, Vasileios Belagiannis, Student Member, IEEE, Stefanie Demirci, and Nassir Navab, Member, IEEE

Can Masses of Non-Experts Train Highly Accurate Image Classifiers?

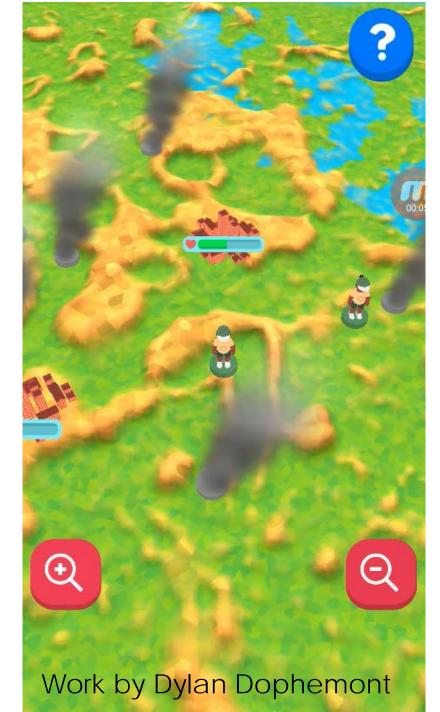
A Crowdsourcing Approach to Instrument Segmentation in Laparoscopic Images

Lena Maier-Hein^{1,*,**}, Sven Mersmann¹, Daniel Kondermann², Sebastian Bodenstedt³, Alexandro Sanchez², Christian Stock⁴, Hannes Gotz Kenngott⁵, Mathias Eisenmann³, and Stefanie Speidel³

Crowdsourcing airway annotations

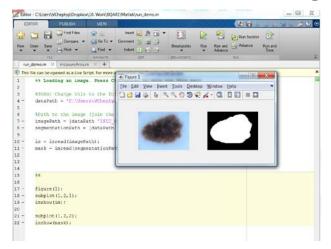


Cheplygina, V et al. (2016). Early Experiences with Crowdsourcing Airway Annotations MICCAI LABELS 2016

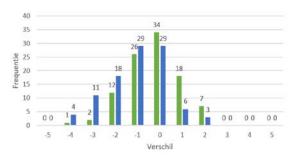




1. Measure features with algorithms



3. Evaluate



Asymmetrie Kleurverschil

Grafiek 1: De frequenties van de verschilwaardes tussen de metingen in Matlab en de metingen op het oog.

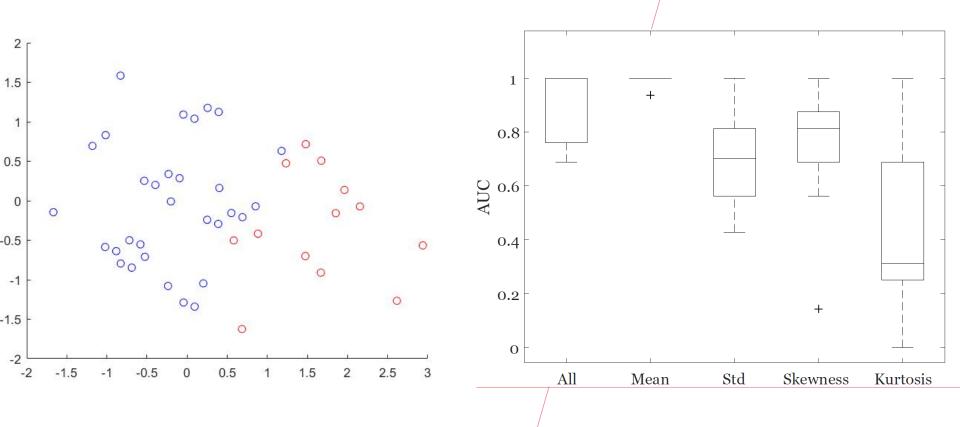
2. Measure features yourself

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	26	ISIC_0009933	1	2	1
28 ISIC_0009936 1 2 0	27	ISIC_0009935	1	3	1
	28	ISIC_0009936	1	2	0

Crowdsourcing!

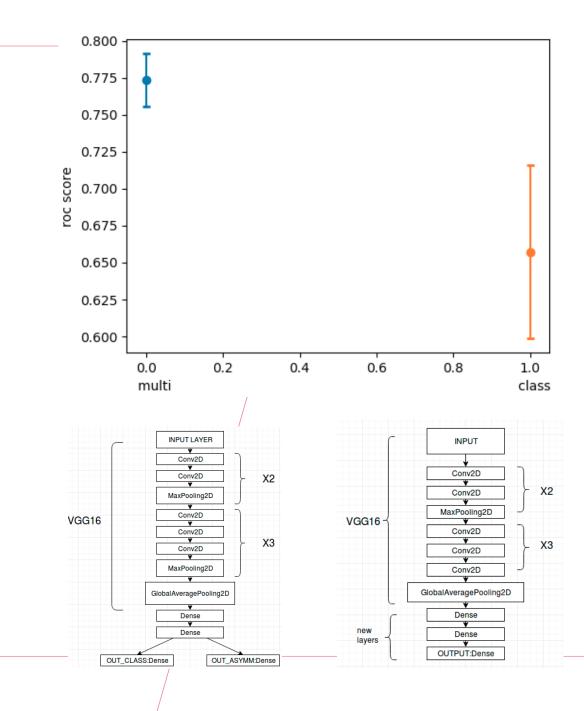
Analyzing 100 annotated images

- 5 features: asymmetry etc
- 6 annotators
- Predict healthy vs melanoma without any image data



Work by Elif Kubra Contar

Multi-task approach outperforms classification-only approach



Not-so-supervised academics



2011-2014 PhD

- "Publish papers"
- Science vs prestige
- "Good for your CV"
- Experience vs time



Maybe academic career?

- "You have to go abroad"
- Not good enough?

The Economist	World politics	Business & finance	Economics	Science & technology	Culture

The disposable academic

Why doing a PhD is often a waste of time

• Mentors!



PROFESSIONAL JOBS SUMMITS RANKINGS

Too many PhDs, not enough tenured positions

European study reveals stress suffered by doctoral holders over insecurity of academic careers

2015



Erasmus MC Universitair Medisch Centrum Rotterdam

zafing



2015 – 2016

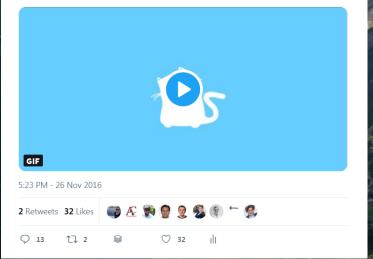
- "Publish, develop own research + get funding for it"
- Social media
 - Impact, community

https://pixabay.com/en/mountain-climbing-mountaineer-802099/



@vcheplygina

Excited to announce that I'll join the Medical Image Analysis group @TUeindhoven as assistant professor in Feb 2017! veronikach.com/news/



1. Excitement

I get to do research and teach and learn from others for the next 5 years! How amazing have so many ideas, I can't wait!

2. Relief

I get to have a job for 5 years and don't have to apply for positions for like, a very long t started looking for my next position halfway through my postdoc, which was a job in its not reflect well on my postdoc project. A few things were not really going well for me in the news about the position couldn't have come at a better time.

3. Fear

I worry they will discover I'm an impostor and they should have hired somebody else. I reassure myself by thinking that if I'm an impostor and they are the the real deal, they figured out that I was one already. But I also worry about just being able to handle it all.

4. Guilt

As many other researchers are forced out of academia, I feel guilty for "surviving" whil "good, but not excellent CV" (citing reviews on some of my rejected grant applications have to deal with hundreds of rejections - I applied to four jobs, interviewed for three, a offered one. Sure, I worked hard, but I think luck and privilege played a big role.

5. Hope

I get to be one step closer to maybe one day being able to change things, just a little bi

https://veronikach.com/progress-reports/get

2017+ Not without challenges



2017+ Find others to support you



https://unsplash.com/photos/iuqmGmst5Po

Academia as supervised learning?

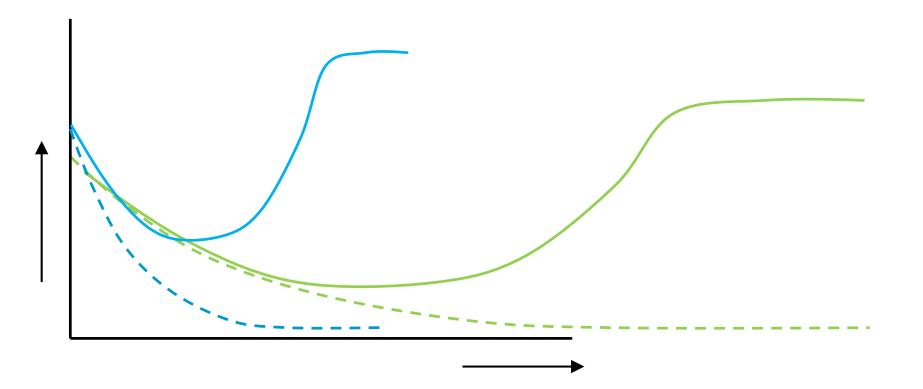
- Input = CV at time t
- Output = Success / failure at t+1
- Successes at t+1 define "decision tree"



But CVs ≠ true data distribution

- Input space is much larger (Shadow CV)
- Output space is much larger (Impact, being happy)
- Noisy labels, many unlabelled inputs

Overfitting



Not-so-supervised advice

- People vs projects
- Examples vs rules
- Explore vs repeat

Not-so-supervised learning of

Not-so-supervised learning of

- ... algorithms
- Multiple instance learning
- Transfer learning
- Crowdsourcing

.. academics

@vcheplygina

http://www.veronikach.com



David Tax Marco Loog PRB

Aasa Feragen Chloe Azencott Marleen de Bruijne

BIGR Josien Pluim Mitko Veta IMAG/e

Bettina Speckmann MICCAI LABELS My students

Buffy Wocky! Ariston'80 Ladies 2 Mattias Hansson **S**pinazie Waardeloze Wetenschappers AssistantProfSupport MICrowd How I Fail Spoonles

Heartbeats Pixel and Dot

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