

# Machine Learning

Resources and References

# Machine learning crash course (self paced) (MLCC)

Secure | <https://developers.google.com/machine-learning/crash-course/logistic-regression/calculating-a-probability>

## Machine Learning Crash Course

OVERVIEW COURSE EXERCISES GLOSSARY

Introduction  
Prerequisites and Prework

ML Concepts

- ▶ Introduction to ML (3 min)
- ▶ Framing (15 min)
- ▶ Descending into ML (20 min)
- ▶ Reducing Loss (60 min)
- ▶ First Steps with TF (60 min)
- ▶ Generalization (15 min)
- ▶ Training and Test Sets (25 min)
- ▶ Validation (40 min)
- ▶ Representation (65 min)
- ▶ Feature Crosses (70 min)
- ▶ Regularization: Simplicity (40 min)
- ▶ Logistic Regression (20 min)
- ▶ Classification (90 min)
- ▶ Regularization: Sparsity (45 min)
- ▶ Introduction to Neural Nets (55 min)
- ▶ Training Neural Nets (40 min)
- ▶ Multi-Class Neural Nets (50 min)
- ▶ Embeddings (80 min)

ML Engineering

- ▶ Production ML Systems (3 min)
- ▶ Static vs. Dynamic Training (7 min)
- ▶ Static vs. Dynamic Inference (7 min)
- ▶ Data Dependencies (14 min)

Estimated Time: 10 minutes

Many problems require a probability estimate as output. Logistic regression is an extremely efficient mechanism for calculating probabilities. Practically speaking, you can use the returned probability in either of the following two ways:

- "As is"
- Converted to a binary category.

Let's consider how we might use the probability "as is." Suppose we create a logistic regression model to predict the probability that a dog will bark during the middle of the night. We'll call that probability:

```
p(bark | night)
```

If the logistic regression model predicts a `p(bark | night)` of 0.05, then over a year, the dog's owners should be startled awake approximately 18 times:

```
startled = p(bark | night) * nights
18 ≈ 0.05 * 365
```

In many cases, you'll map the logistic regression output into the solution to a binary classification problem, in which the goal is to correctly predict one of two possible labels (e.g., "spam" or "not spam"). A later module focuses on that.

You might be wondering how a logistic regression model can ensure output that always falls between 0 and 1. As it happens, a **sigmoid function**, defined as follows, produces output having those same characteristics:

$$y = \frac{1}{1 + e^{-z}}$$

The sigmoid function yields the following plot:

# Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems

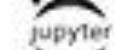
- Aurélien Géron

O'REILLY®

# Hands-On Machine Learning with Scikit-Learn & TensorFlow

CONCEPTS, TOOLS, AND TECHNIQUES  
TO BUILD INTELLIGENT SYSTEMS

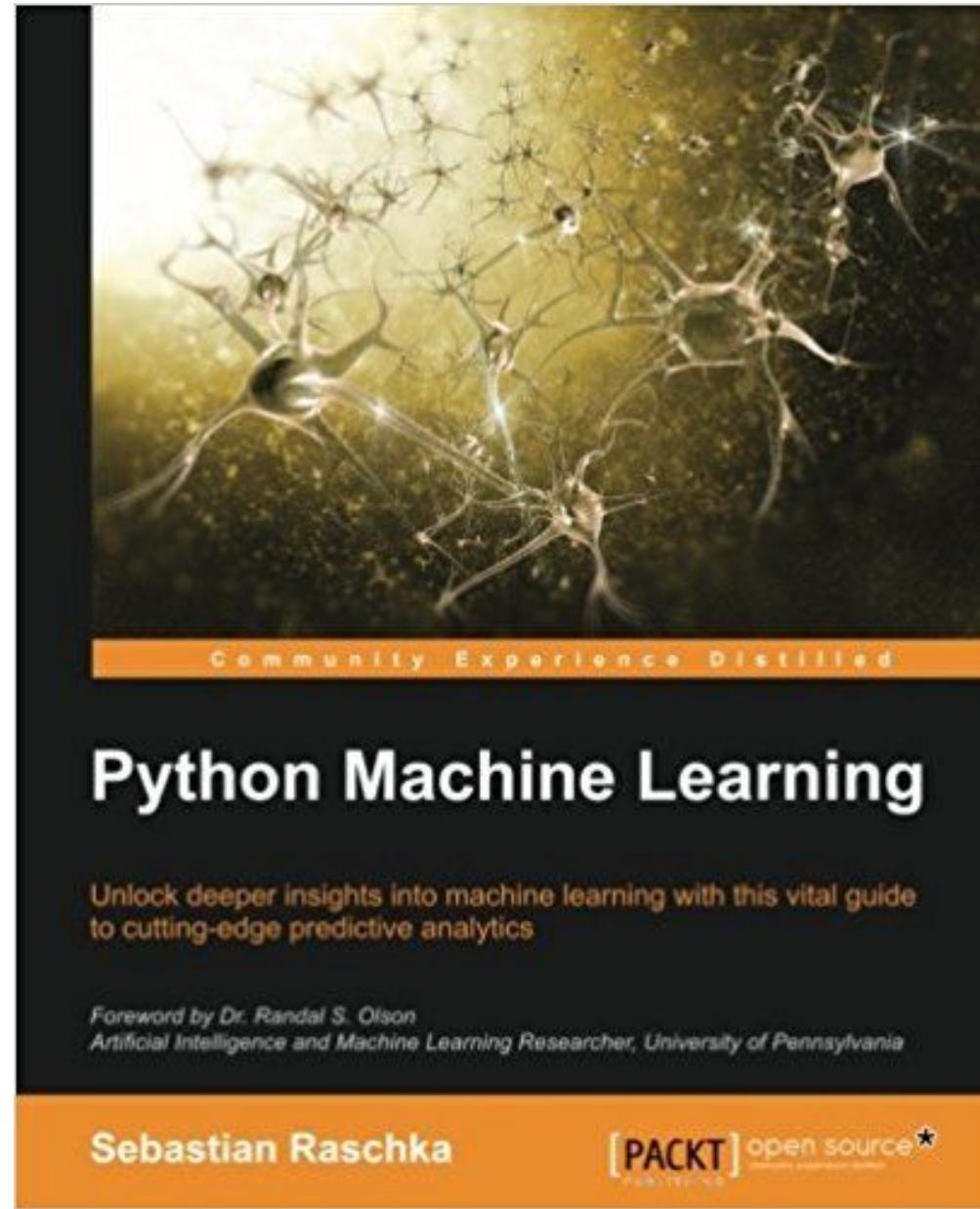


powered by  
jupyter

Aurélien Géron

# Python Machine Learning - Sebastian Roschka

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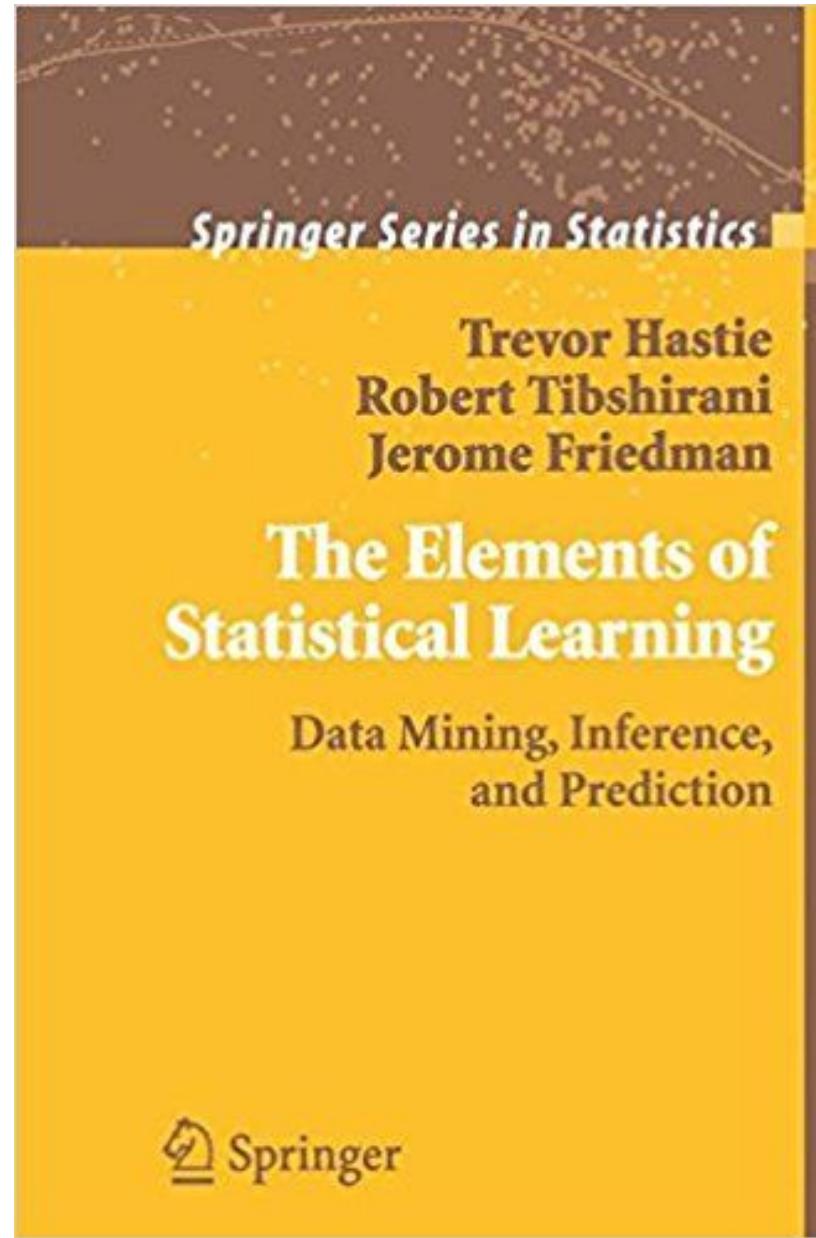


# Deep Learning (Adaptive Computation and Machine Learning series) - Ian Goodfellow



**The Elements of  
Statistical Learning:  
Data Mining,  
Inference, and  
Prediction - Trevor  
Hastie**

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# OpenIntro Statistics

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# OpenIntro Statistics

Third Edition



David M Diez  
Christopher D Barr  
Mine Çetinkaya-Rundel

3

Machine  
Learning  
(MOOC) -  
Andrew Ng  
(coursera.org)



Machine Learning  
Stanford University

Deep Learning  
(MOOC)-  
Andrew Ng  
(coursera.org)

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Deep Learning  
[deeplearning.ai](http://deeplearning.ai)

# Class notes from Machine Learning - Andrew Ng

[https://1drv.ms/f/s!AqPMqweMPzEegpsyjwSffQygi\\_En8w](https://1drv.ms/f/s!AqPMqweMPzEegpsyjwSffQygi_En8w)

<http://cs229.stanford.edu/syllabus.html>

# CS231n: Convolutional Neural Networks for Visual Recognition

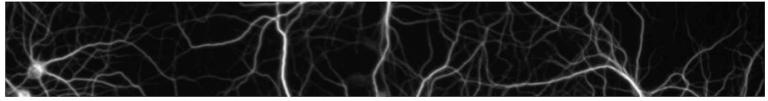
Stanford

- <http://cs231n.github.io/>
- <https://www.youtube.com/playlist?list=PL3FW7Lu3i5JvHM8ljYj-zLfQRF3EO8sYv>

# Dataset for Deep Learning

<http://deeplearning.net/datasets/>

Deep Learning... moving beyond shallow machine learning since 2006!



## Datasets

These datasets can be used for benchmarking deep learning algorithms:

### Music Datasets

- Piano-midi.de: classical piano pieces (<http://www.piano-midi.de/>)
- Nottingham : over 1000 folk tunes (<http://abc.sourceforge.net/NMD/>)
- MuseData: electronic library of classical music scores (<http://musescore.stanford.edu/>)
- JSB Chorales: set of four-part harmonized chorales (<http://www.jsbchorales.net/index.shtml>)
- FMA: A Dataset For Music Analysis (<https://github.com/mdeff/fma>)

### Natural Images

- MNIST: handwritten digits (<http://yann.lecun.com/exdb/mnist/>)
- NIST: similar to MNIST, but larger
- Perturbed NIST: a dataset developed in Yoshua's class (NIST with tons of deformations)
- CIFAR10 / CIFAR100: 32x32 natural image dataset with 10/100 categories (<http://www.cs.utoronto.ca/~kriz/cifar.html>)
- Caltech 101: pictures of objects belonging to 101 categories ([http://www.vision.caltech.edu/Image\\_Datasets/Caltech101/](http://www.vision.caltech.edu/Image_Datasets/Caltech101/))
- Caltech 256: pictures of objects belonging to 256 categories ([http://www.vision.caltech.edu/Image\\_Datasets/Caltech256/](http://www.vision.caltech.edu/Image_Datasets/Caltech256/))
- Caltech Silhouettes: 28x28 binary images contains silhouettes of the Caltech 101 dataset
- STL-10 dataset is an image recognition dataset for developing unsupervised feature learning, deep learning, self-taught learning algorithms. It is inspired by the CIFAR-10 dataset but with some modifications. (<http://www.stanford.edu/~acoates/stl10/>)
- The Street View House Numbers (SVHN) Dataset – <http://ufldl.stanford.edu/housenumbers/>
- NORB: binocular images of toy figurines under various illumination and pose (<http://www.cs.nyu.edu/~vlylab/data/norb-v1.0/>)
- Imagenet: image database organized according to the WordNet hierarchy (<http://www.image-net.org/>)
- Pascal VOC: various object recognition challenges (<http://pascallin.ecs.soton.ac.uk/challenges/VOC/>)
- Labelme: A large dataset of annotated images, <http://labelme.csail.mit.edu/Release3.0/browserTools/php/dataset.php>
- COIL 20: different objects imaged at every angle in a 360 rotation (<http://www.cs.columbia.edu/CAVE/software/softlib/coil-20.php>)
- COIL100: different objects imaged at every angle in a 360 rotation (<http://www.cs.columbia.edu/CAVE/software/softlib/coil-100.php>)

### Artificial Datasets

Archives

- July 2016
- December 2015
- November 2015
- October 2015
- September 2015
- July 2015
- November 2014
- October 2014
- September 2014
- May 2014
- April 2014
- January 2014
- December 2013
- October 2013
- September 2013
- August 2013
- July 2013
- June 2013
- May 2013
- April 2013
- March 2013
- February 2013
- January 2013
- December 2012
- January 2012
- August 2011
- June 2011
- February 2011

# Kaggle machine learning competition

## Kaggle.com

Secure | <https://www.kaggle.com/competitions>

### 15 Active Competitions

 <b>2018 Data Science Bowl</b> Find the nuclei in divergent images to advance medical discovery Featured · 14 days to go · 🧠 biology	\$100,000 3,288 teams
 <b>Google Cloud &amp; NCAA® ML Competition 2018-Men's</b> Apply Machine Learning to NCAA® March Madness® Featured · 8 hours to go · 🏀 basketball	\$50,000 934 teams
 <b>TalkingData AdTracking Fraud Detection Challenge</b> Can you detect fraudulent click traffic for mobile app ads? Featured · a month to go ·	\$25,000 2,072 teams
 <b>iMaterialist Challenge (Furniture) at FGVC5</b> Image Classification of Furniture & Home Goods. Research · 2 months to go ·	\$2,500 141 teams
 <b>Google Landmark Retrieval Challenge</b> Given an image, can you find all of the same landmarks in a dataset? Research · 2 months to go · 📸 image data	\$2,500 101 teams
 <b>Google Landmark Recognition Challenge</b> Label famous (and not-so-famous) landmarks in images Research · 2 months to go · 📸 image data	\$2,500 192 teams
 <b>ImageNet Object Detection Challenge</b> Identify and label everyday objects in images Research · 12 years to go · 📸 image data, object detection	Knowledge 0 teams

# UCI machine learning repo for datasets

Screenshot of the UCI Machine Learning Repository website (<https://archive.ics.uci.edu/ml/datasets.html>)

The page displays a list of 426 data sets. The columns include Name, Data Types, Default Task, Attribute Types, # Instances, # Attributes, and Year. The table is sorted by Name.

Name	Data Types	Default Task	Attribute Types	# Instances	# Attributes	Year
Abalone	Multivariate	Classification	Categorical, Integer, Real	4177	8	1995
Adult	Multivariate	Classification	Categorical, Integer	48842	14	1996
Annealing	Multivariate	Classification	Categorical, Integer, Real	798	38	
Anonymous Microsoft Web Data		Recommender-Systems	Categorical	37711	294	1998
Arrhythmia	Multivariate	Classification	Categorical, Integer, Real	452	279	1998
Artificial Characters	Multivariate	Classification	Categorical, Integer, Real	6000	7	1992
Audiology (Original)	Multivariate	Classification	Categorical	226		1987

# Blogs of AI, ML

- <https://machinelearningmastery.com/blog/>
- <https://blog.algorithmia.com/>
- <https://aitopics.org/search>
- <https://machinelearnings.co/>
- <https://chatbotsmagazine.com/>
- <https://chatbotslife.com/>
- <http://www.33rdsquare.com/>
- <https://openai.com/blog>
- <https://intelligence.org/blog/>
- <https://www.reddit.com/r/artificial/>
- <https://aitopics.org/search>
- <https://machinelearnings.co/>
- <https://www.artificial-intelligence.blog/>
- [Allen Institute for Artificial Intelligence](#)
- <https://www.reddit.com/r/singularity/>
- <http://research.baidu.com/>
- <https://www.artificiallawyer.com/>
- <http://www.expertsystem.com/blog/>
- <https://aws.amazon.com/blogs/ai>
- <https://medium.com/ai-roadmap-institute>
- <https://deepmind.com/blog/>
- <https://www.inbenta.com/en/blog/>
- <https://blog.clarifai.com/>
- <https://www.datarobot.com/blog/>
- <https://medium.com/archieai>
- <https://www.singularityweblog.com/blog/>
- <https://iris.ai/blog/>
- <https://blogs.nvidia.com/>

# More References

- [Machine Learning Lecture Notes from MIT](#)
- [Challenges in Machine Learning and Data Mining](#)
- [Introduction to Statistical Learning](#)
- [Machine Learning Slides from Edx](#)
- [Matrix Cookbook](#)
- [Deep Learning Book](#)
- [Michael Nielsen's tutorials](#)
- [Convolutional Neural Network for Visual Recognition](#)
- [Basic Derivative Formula](#)
- [Oxford University Deep learning Course Material](#)
- [Deep Learning Mind Map](#)
- [MIT Course - Deep Learning for Self Driving Car](#)
- [CS231n: Convolutional Neural Networks for Visual Recognition](#)
- [Artificial Intelligence - A modern approach](#)
- [Mathematical Summary](#)
- [Kernel functions in machine learning](#)
- [Introduction to linear algebra](#)
- [Jupyter Notebook Tips](#)
- [Parallel Algorithms](#)

# Research papers

The screenshot shows a web browser displaying a research paper from arXiv.org. The title of the paper is "The Matrix Calculus You Need For Deep Learning" by Terence Parr and Jeremy Howard. The paper was submitted on 5 Feb 2018 and revised on 6 Feb 2018. The content discusses matrix calculus rules and terminology relevant to deep learning. The page includes links for comments, subjects (Learning [cs.LG], Machine Learning [stat.ML]), and citation details (arXiv:1802.01528 [cs.LG]). A sidebar on the right provides download options (PDF, Other formats), current browse context (cs.LG), and references & citations (NASA ADS). The Cornell University Library logo is visible at the top left.

Secure | https://arxiv.org/abs/1802.01528

Cornell University Library

We gratefully acknowledge support from the Simons Foundation and member institutions.

arXiv.org > cs > arXiv:1802.01528

Search or Article ID All papers

Computer Science > Learning

**The Matrix Calculus You Need For Deep Learning**

Terence Parr, Jeremy Howard

(Submitted on 5 Feb 2018 ([v1](#)), last revised 6 Feb 2018 (this version, v2))

This paper is an attempt to explain all the matrix calculus you need in order to understand the training of deep neural networks. We assume no math knowledge beyond what you learned in calculus 1, and provide links to help you refresh the necessary math where needed. Note that you do not need to understand this material before you start learning to train and use deep learning in practice; rather, this material is for those who are already familiar with the basics of neural networks, and wish to deepen their understanding of the underlying math. Don't worry if you get stuck at some point along the way---just go back and reread the previous section, and try writing down and working through some examples. And if you're still stuck, we're happy to answer your questions in the Theory category at forums.fast.ai. Note: There is a reference section at the end of the paper summarizing all the key matrix calculus rules and terminology discussed here.

Comments: PDF version of mobile/web friendly version [this http URL](#)

Subjects: Learning (cs.LG); Machine Learning (stat.ML)

Cite as: arXiv:1802.01528 [cs.LG]

(or arXiv:1802.01528v2 [cs.LG] for this version)

Submission history

From: Terence Parr [[view email](#)]

[v1] Mon, 5 Feb 2018 17:37:59 GMT (434kb,D)  
[v2] Tue, 6 Feb 2018 17:35:28 GMT (439kb,D)

Which authors of this paper are endorsers? | Disable MathJax (What is MathJax?)

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Current browse context:  
cs.LG  
< prev | next >  
new | recent | 1802

Change to browse by:  
cs  
stat  
stat.ML

References & Citations

- NASA ADS

Bookmark (what is this?)

# Articles on deep learning

- 
- [Understanding Neural Network: A beginner's guide](#)
  - [Artificial Neural Network \(ANN\) in Machine Learning](#)
  - [30 Free Courses: Neural Networks, Machine Learning, Algorithms, AI](#)
  - [Building Convolutional Neural Networks with Tensorflow](#)
  - [A simple neural network with Python and Keras +](#)
  - [Implementing a Neural Network from Scratch in Python](#)
  - [Neural Networks: Crash Course On Multi-Layer Perceptron](#)
  - [Understanding Neural Networks with TensorFlow Playground](#)
  - [Making data science accessible – Neural Networks](#)
  - [Must Know Tips/Tricks in Deep Neural Networks](#)
  - [An Introduction to Implementing Neural Networks using TensorFlow](#)
  - [Yet another introduction to Neural Networks](#)
  - [Matrix Multiplication in Neural Networks](#)
  - [Neural Networks: The Backpropagation algorithm in a picture](#)
  - [Accelerating Convolutional Neural Networks on Raspberry Pi](#)
  - [The Unreasonable Effectiveness of Recurrent Neural Networks](#)
  - [Book: Neural Networks and Statistical Learning](#)
  - [Neural Networks as a Corporation Chain of Command](#)
  - [Recurrent neural networks, Time series data and IoT](#)
  - [Predicting Car Prices Using Neural Network](#)
  - [Beyond Deep Learning – 3rd Generation Neural Nets](#)
  - [Use Neural Networks to Find the Best Words to Title Your eBook](#)

# Image Dataset for object detection

Dataset	Description
<a href="https://github.com/openimages/dataset">https://github.com/openimages/dataset</a>	Open Images is a dataset of ~9 million URLs to images that have been annotated with image-level labels and bounding boxes spanning thousands of classes
<a href="http://cocodataset.org/#home">http://cocodataset.org/#home</a>	Image segmentation on household items
<a href="https://hci.iwr.uni-heidelberg.de/node/6132">https://hci.iwr.uni-heidelberg.de/node/6132</a>	Dataset image segmentation on traffic lights
<a href="http://www.cvlibs.net/datasets/kitti/">http://www.cvlibs.net/datasets/kitti/</a>	Computer vision for autonomous car
<a href="https://cs.stanford.edu/~roozbeh/pascal-context/">https://cs.stanford.edu/~roozbeh/pascal-context/</a>	Semantic segmentation task by providing annotations for the whole scene
<a href="http://host.robots.ox.ac.uk/pascal/VOC/index.html">http://host.robots.ox.ac.uk/pascal/VOC/index.html</a>	Object class recognition. Images are originally from flickr.

# Computer Vision Reading Group

① [www.cs.ubc.ca/nest/lci/cvrg/](http://www.cs.ubc.ca/nest/lci/cvrg/)



## Computer Vision Reading Group

To **subscribe** to the mailing list for talk announcements, send a message to [majordomo@cs.ubc.ca](mailto:majordomo@cs.ubc.ca) with the words **subscribe cvrg-l** in the body.

A list of upcoming papers can be found [below](#). To be added to the schedule contact **Bicheng Xu** ([bichengx@cs.ubc.ca](mailto:bichengx@cs.ubc.ca)).

### Upcoming presentations

Date	Presenter	Paper or topic
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### Finished presentations, 2018

Date	Presenter	Paper or topic
Apr. 6	Candice	What have we learned from deep representations for action recognition? <a href="#">[link]</a>
Mar. 23	Gursimran	A Simple Neural Network Module for Relational Reasoning <a href="#">[link]</a>
Mar. 2	Polina	Inferring Semantic Layout for Hierarchical Text-to-Image Synthesis <a href="#">[link]</a>
Feb. 16	Suhail	AttrGAN <a href="#">[link]</a> Generative Adversarial Text to Image Synthesis <a href="#">[link]</a>
Feb. 9	Borna	Mask R-CNN <a href="#">[link]</a>
Feb. 2	Bicheng	Teaching Machines to Describe Images via Natural Language Feedback <a href="#">[link]</a>
Jan. 26	Alireza	Is it hard to say I don't know?
Jan. 19	Bo Zhao	Inferring and Executing Programs for Visual Reasoning <a href="#">[link]</a>

<http://www.cs.ubc.ca/nest/lci/cvrg/>