



Computer Aided Medical Procedures (CAMP)

# Seminar: Deep Learning for Medical Applications

Winter Semester 2017



Technische Universität München



JOHNS HOPKINS  
WHITING SCHOOL  
of ENGINEERING

# Team

- **Prof. Nassir Navab**
- **Course organizer:**
  - Shadi Albarqouni
  - Email: [shadi.albarqouni@tum.de](mailto:shadi.albarqouni@tum.de)
  - Webpage: <http://campar.in.tum.de/Main/ShadiAlbarqouni>
- **Tutors:**
  - Christoph Baur
  - Ahmad Ahmadi
  - Marie Piraud
  - Patrick Christ
  - Hasan Sarhan



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## Intelligent Machines

# An AI Ophthalmologist Shows How Machine Learning May Transform Medicine

Google researchers trained an algorithm to recognize a common form of eye disease as well as many experts can.

by Will Knight    November 29, 2016

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Google researchers got an eye-scanning algorithm to figure out on its own

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## Business Report

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# Can Technology Fix Medicine?

## [Skin Cancer Classification with Deep Learning](#)



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## Rewriting Life

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# Deep Learning Is a Black Box, but Health Care Won't Mind

New algorithms are able to diagnose disease as accurately as expert physicians.

by Monique Brouillette    April 27, 2017

**E**arlier this year, artificial intelligence scientist Sebastian Thrun and colleagues at Stanford University demonstrated that a “deep learning” algorithm was capable of diagnosing potentially cancerous skin lesions as accurately as a board-certified dermatologist.

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## Intelligent Machines

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# The Dark Secret at the Heart of AI

No one really knows how the most advanced algorithms do what they do. That could be a problem.

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## Intelligent Machines

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# The Artificially Intelligent Doctor Will Hear You Now

U.K.-based startup Babylon will launch an app later this year that will listen to your symptoms and provide medical advice. Will it help or hinder the health-care system?

by Simon Parkin    March 9, 2016

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# Deep Learning Activities @CAMP, TU Munich

<https://prezi.com/rancb7fbzuam/deep-learning-activities-at-camp/>

Deep Learning Papers on Medical Image Analysis

<https://github.com/albarqouni/Deep-Learning-for-Medical-Applications>



# Basic Info about the course

- **Type:** Master Seminar (IN2107)
- **Language:** English
- **SWS:** 2
- **ECTS:** 5 Credits
- **Webpage:**
  - <http://campar.in.tum.de/Chair/TeachingWs17DLMA> (files are password-protected)
- **Time:**
  - Mondays, 12-14
- **Location:**
  - CAMP Seminar Room (03.13.010)
- **Requirements:**
  - **Good Background in Machine Learning methods.**



# Objective

- Learn through **read, understand, present, and discuss** many challenges present in Medical Applications:
  - Limited amount of annotated data
  - Learning from scratch / Transfer Learning / Fine-tuning
  - Can deep networks be used effectively for medical tasks?
  - Is transfer learning from general imagery to the medical domain relevant?
  - Can we rely on learned features alone or may we combine them with handcrafted features for the task?



# Discussed topics:

- **Tools:**
  - Convolutional Neural Networks (CNN)
  - Recurrent Neural Networks (RNN) - (LSTM)
  - Long Short Term Memory (LSTM)
  - Generative Adversarial Networks (GAN)
  - Convolutional AutoEncoders (CAE)
- **Medical Applications:**
  - Lesion Detection
  - Lesion Segmentation
  - Network Exploration
  - Learning Methodology (Supervised, Semi-Supervised or Unsupervised)
  - Image Parsing
  - Multi-Instance Learning
  - Crowdsourcing



# Schedule (tentative)

Date	Topic	Slides	Students
10.07.2017	Preliminary Meeting		Students who join this meeting and show their interest will have high priority!
16.10.2017	Kick-Off Session	<a href="#">Review</a>	CNN (), RNN (), Autoencoders ()
06.11.2017	Presentation Session 1		
13.11.2017	Presentation Session 2		
04.12.2017	Presentation Session 3		
11.12.2017	Presentation Session 4		
08.01.2018	Presentation Session 5		
15.01.2018	Presentation Session 6		



# Presentation (50%)

- 20 minutes + 10 minutes Q&A
- slides (Powerpoints, Latex, see website for templates)
- they should cover all relevant aspects of the paper
  - Motivation
  - Methodology
  - Experimental results
  - Take Home Message
  - Discussion
- self-contained (review of state of the art is necessary!)
- **all students are expected to attend all presentations and interact during Q&A**  
(this will influence your final mark)



## Report (40%)

- should summarize the paper in **your own words** including one/two figures explaining the methodology
- Summary should include:
  - Purpose
  - Methods
  - Experimental results
  - **Discussion**
- language: English
- max 2 pages
- template on course website (latex) --- lrzgit (shared tex)

## Attendance(10%)



# Roadmap



If you are still interested in the seminar, please write a brief motivation paragraph (*few lines*) showing your interest and your background in Machine/Deep Learning.

Send this email, with a title “**DLMA\_Motivation**”, to Shadi Albarqouni ([shadi.albarqouni@tum.de](mailto:shadi.albarqouni@tum.de)) till **14.07.2017**.

**Don't forget to register at TUM matching system**

**14.07. to 19.07.17:** register via [matching.in.tum.de](http://matching.in.tum.de)

