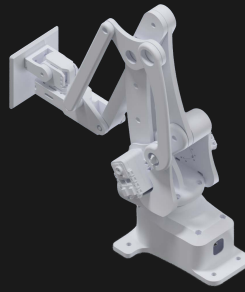


RoboVis

Alistair Wick

EvoArm

- Small robot arm
- 3 degrees of freedom
- 3D printable
- Controlled with a Python App
- ... where to go from here?



Customization!

- Every 3D-printed arm can be different
- Change mechanics for different purposes

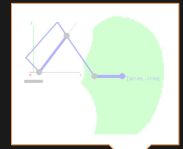


Dimensions
Design constraints
Servo constraints

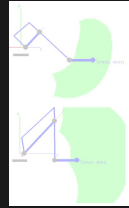
Config

IK

Solution



Exploring Possible Configs



← Changing one of dozens of parameters

- Tedious and impractical to try many designs
- Different people need different capabilities
- Can the exploration process be made accessible?

Dimensions
Design constraints
Servo constraints

Config

IK

Solution

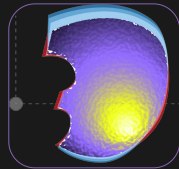
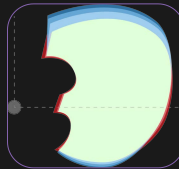
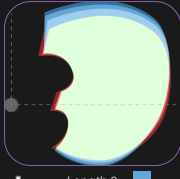


Want to rapidly iterate - new/different configs

Vis can help!

Vis Idea

- Interactive exploration of design space
- **Data:** Calculated online
 - Reachable points
 - Max load (across reachable space)
 - Max velocity (across reachable space)
- **Design:**
 - Spatial data -> spatial display?
 - Derive attributes?
 - Combine certain parameters?



PITCH: VISUALIZING THE ENERGY PERFORMANCE OF A BUILDING

ARASH SHADKAM

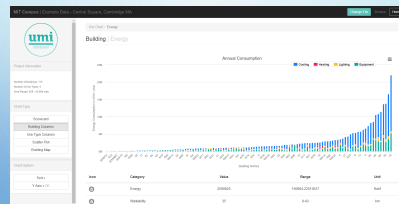
WHAT

- ENERGY PERFORMANCE DATA OF A BUILDING (FOR NOW THE BUILDING IS THE CENTER FOR INTERACTIVE RESEARCH ON SUSTAINABILITY / "CIBS")
- TIME-SERIES DATA FROM SENSORS INCLUDING TEMPERATURE AND OCCUPANCY DATA (IF POSSIBLE)
- DERIVED, NORMALIZED ENERGY PERFORMANCE DATA

WHY

- BETTER UNDERSTANDING OF THE BUILDING'S ENERGY PERFORMANCE
- DISCOVERING TRENDS AND CORRELATIONS IN THE ENERGY PERFORMANCE DATA AND IDENTIFY POTENTIAL OPTIMIZATION OPPORTUNITIES IN THE BUILDING'S PERFORMANCE

HOW



HOW

- FACET: MULTI-FORM OVERVIEW-DETAIL VIEWS/LINKED HIGHLIGHTING
- MANIPULATE, SELECT
- REDUCE FILTER/RANGE SLIDERS FOR DIFFERENT TIME SPANS

THANKS!

Who is Scandio?

- 2016:
 - 40 employees
 - 82 clients
 - 176 projects
- Projects:
 - **Fixed price** ("client pays what's estimated")
 - Time and material ("client pays the hours")



What is a fixed price project at Scandio?

- Efforts range from 5 days - 100 days
- Duration ranges from 3 weeks – 1 year
- Before project starts: effort estimation
- Generally higher risk of "failure"
 - If over estimation in the end, company mostly has to pay (sometimes compromises with client)



What are the project results?

- Total amount of efforts in the end
 - Exactly as estimated (rare)
 - Less than estimated (sometimes) ☺
 - More than estimated (sometimes) ☹



What are the key attributes?

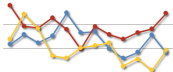
1. Hours worked
 - Employees track time on project in web app
2. Degree of completion (DOC)
 - Estimated monthly by project lead
3. Hourly rate for project
 - Determined in the beginning dependent on budget and total effort
 - Changes retrospectively depending on 1 and 2



? Questions ?



- When do estimation and degree of completion conflict?
- When are our hourly rates too low?
- How do hourly rates change retrospectively?
- What tendencies can we observe over multiple projects?
- When interfere to maintain project success?
- How can we identify wrong estimations on DOC?
- How do project leads differ in their monthly estimations?
- ...



Is there still time?

Time Tracking

Tages-Informationen				
Datum	von	bis	Pause	Stunden
13.05.2014	09:45	17:30	0,75	7,00

Buchungs-Informationen				
Projektkennung	Tätigkeit	Issue ID	Bemerkung	Stunden
DKMS_OPT1	Dashboard	DKMSSUPP-95	Dashboard Anpassungen	1,00
DKMS_OPT1	Dashboard	DKMSSUPP-96	Dashboard styling	0,75
DKMS_OPT1	News-Umstrukturierung	DKMSSUPP-102	News Styling	1,25
BSH_SUPP2014	PIWIK Support	BSSH-22	Test System Sync	0,50
BSH_SUPP2014	Corporate Wiki Support	BSSHUPP-226	Test Upgrade	0,25
INF_SEC2014	POC - User Switch	INFPRJ-18	Diskussionen/Tests/Implementierung Tomcat Proxy	1,00
DKMS_OPT1	TPL		Telko mit Guido zu Projektstand	1,00
DKMS_OPT1	Dashboard	DKMSSUPP-119	Dashboard Performance	1,25

Project results (good)

Mitarbeiterstunden

Mitarbeiter	Stunden
fgrund	60,00
gschmidl	12,50
Summe	72,50

Projektstunden

Tätigkeit	Plan	Ist	Rest
DKMS_OPT1: Blogposts-Plugin	16,00	14,75	1,25
DKMS_OPT1: Dashboard	16,00	15,25	0,75
DKMS_OPT1: IE10 Anpassungen	8,00	2,75	5,25
DKMS_OPT1: News-Migration	8,00	0,75	7,25
DKMS_OPT1: News-Umstrukturierung...	8,00	0,25	-2,25
DKMS_OPT1: Patient Faces	24,00	11,75	12,25
DKMS_OPT1: TPL	4,00	1,75	2,25
Summe	84,00	72,50	11,50

Project results (bad)

Mitarbeiterstunden

Mitarbeiter	Stunden
fgrund	52,00
jgrabski	10,75
jstadler	9,00
Summe	71,75

Projektstunden

Tätigkeit	Plan	Ist	Rest
DKMS_SSO: SSO Link	0,00	14,25	-14,25
DKMS_SSO: SSO Plugin	32,00	57,50	-25,50
Summe	32,00	71,75	-39,75

Thanks.

Visualizing Internal Components of a Convolutional Neural Network

Mahdi Ghodsi - Hooman Shariati

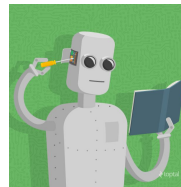
Background:

What is Machine Learning

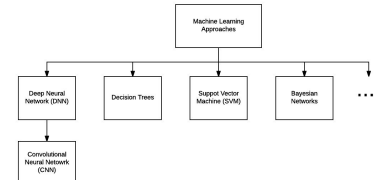
Machine Learning is taking over.

Applied to many fields:

Bioinformatics, Gaming, Medical diagnosis, Marketing, Machine Vision,



Convolutional Neural Network



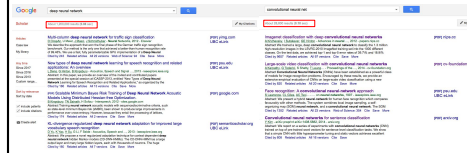
Convolutional Neural Network

The idea has been around since 1980s
But Introduction of GPU computing with 30x speed up gave DNNs a boost



Convolutional Neural Network

Very Popular Research Area



Convolutional Neural Network

However ...

Convolutional Neural Network

How researchers see CNNs

"Neural networks have long been known as "black boxes" because it is difficult to understand exactly how any particular, trained neural network functions due to the large number of interacting, non-linear parts."

Yajin Zhou
Department of Computer Science North Carolina State University

Convolutional Neural Network

How researchers see CNNs

How CNNs looks like

Visualizing and making sense of CNNs in literature:

Visualizing and Understanding Convolutional Networks By M. Zeiler (NYU)

Convolution Fully connected

L0 (Input) 512x512

L1 256x256

L2 128x128

L3 64x64

L4 32x32

F5 F6 (Output)

Visualizing Ambiguity

James Hicklin

Case Scenario

- Imagine you are Betty
- Just finished chemo for breast cancer
- Typical post-chemo therapy is Tamoxifen for 5 years

Tamoxifen 10-year risk estimates compared to 5-year risk estimates (out of 1000)

Attribute	Change
Breast cancer recurrence	↓ 28
Death from breast cancer	↓ 28
Development of gallstones	↑ 2
Development of endometrial cancer	↑ 16
Stroke	↑ 2

Point estimates...

- Imagine Betty only cared about her chance of dying from breast cancer and her chance of developing endometrial cancer

5-year vs. 10-year Tamoxifen Therapy

With confidence intervals...

Alternatives to Error Bars

Violin Plots

Box Plots

Dynamic Icon Arrays

Gradient Plots

Project

- Design new visualization to present ambiguity to patients
- Interactivity
 - Adjust bounds of error
 - Show best & worst case scenarios
 - Show how risk estimates might change given different samples

Dviz

Visualizing Distributed Systems with Stewart Grant and Jodi Spacek

Motivation

- Understanding the behaviour of distributed systems is hard
- Developers need tools for comprehending their systems
- Most distributed systems are designed around FSM
- FSM are often how developers think of their systems
- Can an FSM be generated from an execution so developers can check their mental models?

Concept

- Collect distributed snapshots (state from across the whole system)
- Calculate a distance between each snapshot (xor distance)
- Plot each snapshot at it's relative distance using clustering
- Connect each snapshot with a time curve

etcd (distributed key value store) puts -> gets

Limitations

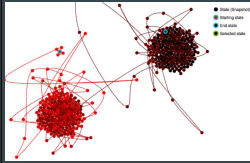
- States are not labeled meaningfully
- Semantics of state transitions are not clear
- FSM's require both

Extensions to Project

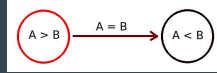
...
Improving Visualization

Interaction Extension

FSM would provide a higher level on which users could zoom in on



Current



Proposed zoom

Filtering the Clusters

- Partitioning: intrinsic meaning
- Collect data invariants: filter to show aggregate data using existing tool set
- Label: Represent clusters by their invariants
- Visualize transitions: use the diff of cluster invariants

Research Questions

- Scatterplots? Occlusion? Continuous scatterplots?
- Interaction?
- Spatial aggregation? Does it make sense?
- Dimensionality reduction? Too much information?
- Effective color coding?
- Dimensional Ordering, Spacing, and Filtering Approach (DOSFA): Similarities show patterns?

Why this project is neat

- Stems from an existing body of work
- Has practical applications for debugging distributed systems
- No end of data to represent, can easily be extended after the course

Visualizing patient clusters

Lovedeep Gondara

Problem

Physician researchers are often interested in data exploration before committing to a project.

Generally use descriptive statistics to see if there are any obvious signals.

Is there any specific group of patients that have the worse outcome compared to the rest?

Are there natural groupings in the dataset?

Is there an underlying structure to the data?

Proposed solution

Cluster visualization

Use dimensionality reduction methods such as t-sne.

Plot resulting clusters.

Draw survival plots by cluster membership.

Allow investigation of cluster membership.

Thanks

Spanner, Resurrected.

CPSC 547 Project Pitch

Madison Elliott
February 16, 2017

Background

- Project originated as an MA thesis in the CS department

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- New technique that applied low-stretch trees to network visualization

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- Implemented novel edge-bundling technique

Background

- Project originated as an MA thesis in the CS department
- New technique that applied low-stretch trees to network visualization
- Implemented novel edge-bundling technique
- Does not rely on fixed vertices/fixed layout or explicit hierarchical data structure

Background

- Two iterations submitted for publication:
 1. Graph Drawing (technique focused)
 2. Pacific Vis (more emphasis on motivation and visualization application)

Background

- Two iterations submitted for publication:
 1. Graph Drawing (technique focused)
 2. Pacific Vis (more emphasis on motivation and visualization application)
- Both **rejected** ☹️

Background

- Two iterations submitted for publication:
 - Graph Drawing (technique focused)
 - Pacific Vis (more emphasis on motivation and visualization application)
- Both **rejected** ☹️
- Reviewer comments largely yearning for a deeper/more defined motivation

Resurrection Pitch

- Find the motivation!

Resurrection Pitch

- Find the motivation!
- Develop and execute a user study

Resurrection Pitch

- Find the motivation!
- Develop and execute a user study
- Revise and resubmit paper

Why?

- Lots of potential!

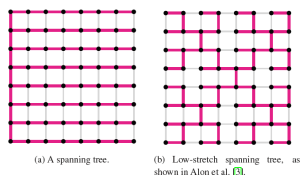
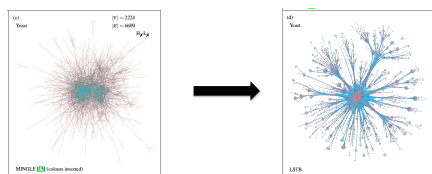


Figure 3: Comparison between an arbitrary spanning tree and a low-stretch spanning tree for an 8-by-8 grid graph.

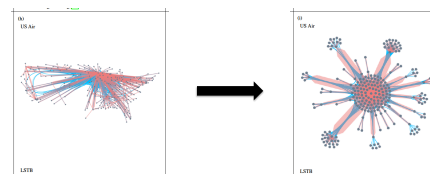
Why?

- De-hairball a cluttered network:



Why?

- Novel, layout free network idioms:



Next Steps

- Complete literature review of network idioms, tasks and taxonomies

Next Steps

- Complete literature review of network idioms, tasks and taxonomies
- Brainstorm new cases where “set” or intuitive network layout is not optimal or necessary for a given task

Questions?

Automatic Grading Service Dataset

NICK BRADLEY
NBRAD11@CS.UBC.CA

Background

Continuous grading service
5.5 GB from **13K** test result records (more coming everyday)
 Some data fields (*don't worry if these don't mean anything to you*)

- Grade for every commit each student made
- Test metrics: # tests pass/fail, coverage, duration
- Code metrics: LOC, build failures
- Grade requests: timestamp
- More data can be pulled from GitHub (diffs, history, branches,...)

Current Instructor Dashboard

Code	files	LOC	% pass	% cover	# fail	# LOC	Results			
02:22:25	cpsc310exam1_exam0	12.0	72.9	95	35.89	33	17	0	210	
02:22:45	cpsc310exam1_exam01	19.3	32.99	22	67.43	11	30	0	606	
02:22:45	cpsc310exam1_exam00	0.2	44	30	95.84	15	30	0	506	
02:22:45	cpsc310exam1_exam04	15.6	32.28	22	68.4	11	30	0	250	
02:22:45	cpsc310exam1_exam05	100.0	25.94	12	72.21	6	44	0	430	
02:22:45	cpsc310exam1_exam06	15.0	77.6	72	95.84	30	14	0	500	
02:22:45	cpsc310exam1_exam17	18.2	87.2	84	96.73	42	8	0	636	

Current Operational Dashboard

AutoTest Queue:
0

Reference UI:
UP

Geocoder:
UP

Class Portal:
UP

Idea + Impact

Student facing dashboard

- Expanded to CS110, CS210, and CS310 + their corresponding MOOC offerings
- Vis will be used by 1000s of students in production system
- Challenge: make it engaging + promote 'good' behaviour
- Feedback: prototype can be made available to current students

Instructor facing dashboard

- Design study with domain expert (current CPSC310 instructor)
- Challenge: needs to scale to 1000s of students

Analysis tool

- Probably only if you are interested in software engineering
- Likely end up as a SE paper

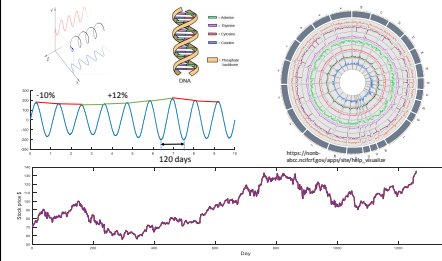
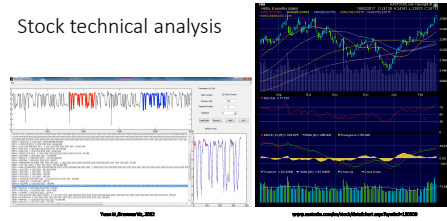
nbrad11@cs.ubc.ca

EMAIL

Visual Methods for Analyzing Motifs in Time-Oriented Data

Sohail Kianzad
PHD student CS

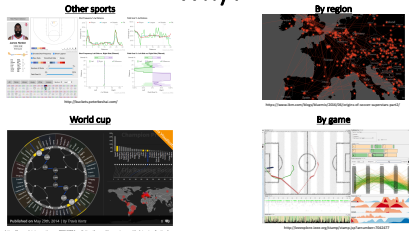
Stock technical analysis



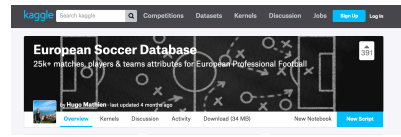
Visualizing European soccer players

Yann Dubois

Why?



What?

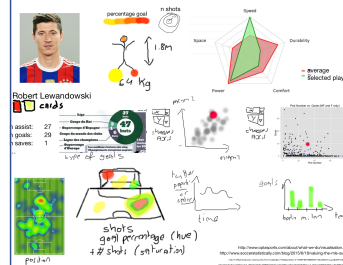


- +25,000 matches
- +10,000 players
- 11 European leagues
- Players and Teams' attributes
- Detailed match events
- Betting odds

+ sports page scrapping

How?

- D3
- P5.js
- Tableau



WHO ARE WE?

- Responsible for academic oversight and support for approx. 300 graduate degree programs
- Strategic leaders in graduate education at UBC
- Support for faculty, programs & students
- Central hub for everything related to graduate students
 - Communications & Recruitment
 - Admission
 - Awards
 - Thesis & Dissertations
 - Doctoral Exams
 - Professional Development
- Approx. 10,000 graduate students in Vancouver



DATA PROJECTS

- Option 1: Canadian Graduate & Professional Student Survey (CGPSS)
 - Satisfaction levels in 13 sections, e.g. general, PD, research experience, financial support, social life
 - Breakdown by discipline, year of study, degree level, gender, etc.
- Option 2: Graduate School data
 - Application data
 - Enrolment statistics
 - Graduation statistics
 - Time in program and completion rates



3

CGPSS

	2010	2013	2016	Total
Doctoral	13 812	18 377	18 822	51 011
Research Masters	13 593	17 546	18 086	49 225
Other Masters	11 213	15 741	16 834	43 788
Total	38 618	51 664	53 742	144 024
univ	38	48	50	



4

CGPSS

- Desired Outcomes:
- Visualize key findings from 2016 study
 - Time comparison: 2010 to 2013 to 2016
 - Benchmarking: program vs. UBC vs. Canada

- Audiences:
- Students
 - Units (access controlled), e.g. program or department dashboard
 - Department Head
 - Program Director
 - Faculty



5

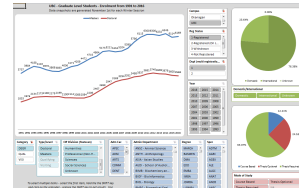
GRADUATE SCHOOL DATA (CURRENT)

REGISTRATION PERIOD (START DATE)	APPLICATIONS	OFFERS	ACCEPTS (SHOW)
2002 (March 01 - 2002)	7,417	2,762	1,722
2003 (March 01 - 2003)	7,587	2,866	1,837
2004 (March 01 - 2004)	7,488	2,886	1,764
2005 (March 01 - 2005)	6,884	2,874	1,820
2006 (March 01 - 2006)	7,006	3,078	2,024
2007 (March 01 - 2007)	7,420	3,287	2,044
2008 (March 01 - 2008)	7,888	3,148	2,155
2009 (March 01 - 2009)	14,170	5,841	3,244
2010 (March 01 - 2010)	17,716	6,846	3,758
2011 (March 01 - 2011)	18,826	7,838	4,244
2012 (March 01 - 2012)	9,720	3,853	2,071
2013 (March 01 - 2013)	8,852	4,446	2,244
2014 (March 01 - 2014)	8,720	4,442	2,102
2015 (March 01 - 2015)	13,600	4,274	2,267
2016 (March 01 - 2016)	15,747	4,874	2,361



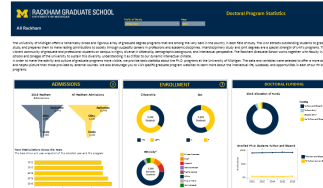
6

GRADUATE SCHOOL DATA (CURRENT)



7

GRADUATE SCHOOL DATA (ALTERNATIVE EXAMPLE)



8

TEAM

Louise Mol
Systems and Data Analysis Manager

Jens Locher
Assistant Dean



9



Visualizing Trends in Product Recommendations

Q.I. Leap Analytics

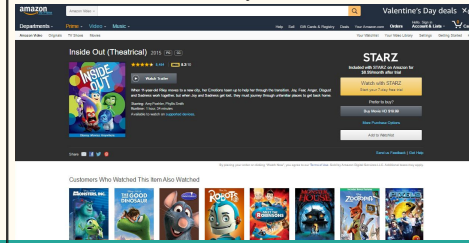
Who are we?

Q.I. Leap Analytics

- Team of data scientists
- Solutions for retail stores
- 2 products
 - Recommender System
 - Interactive Dashboard



What is a recommender system?



What's the visualization task?

End user: Business that is using the Recommender System

End user desires:

- Which items recommended
- Trends in item recommendations
- Cluster users with similar purchase history
- Cluster items with similar buying history



What kind of data would you have to work with?

Transaction data for online store

- 50,000 transactions
- 2,000 unique items
- 13,000 unique customers
- With time, date, city of purchase

native



Generated recommendation data

- Customer, item viewing history, top 10 recommended items (with scores)

Benefits beyond the classroom

- Implemented in our dashboard product so customers would get to see how their recommender system is being used
- Possibility of internship on completion of project

- Talk to me afterwards if interested in the project!



Q.I. Leap

lauren.fratamico@qileap.com