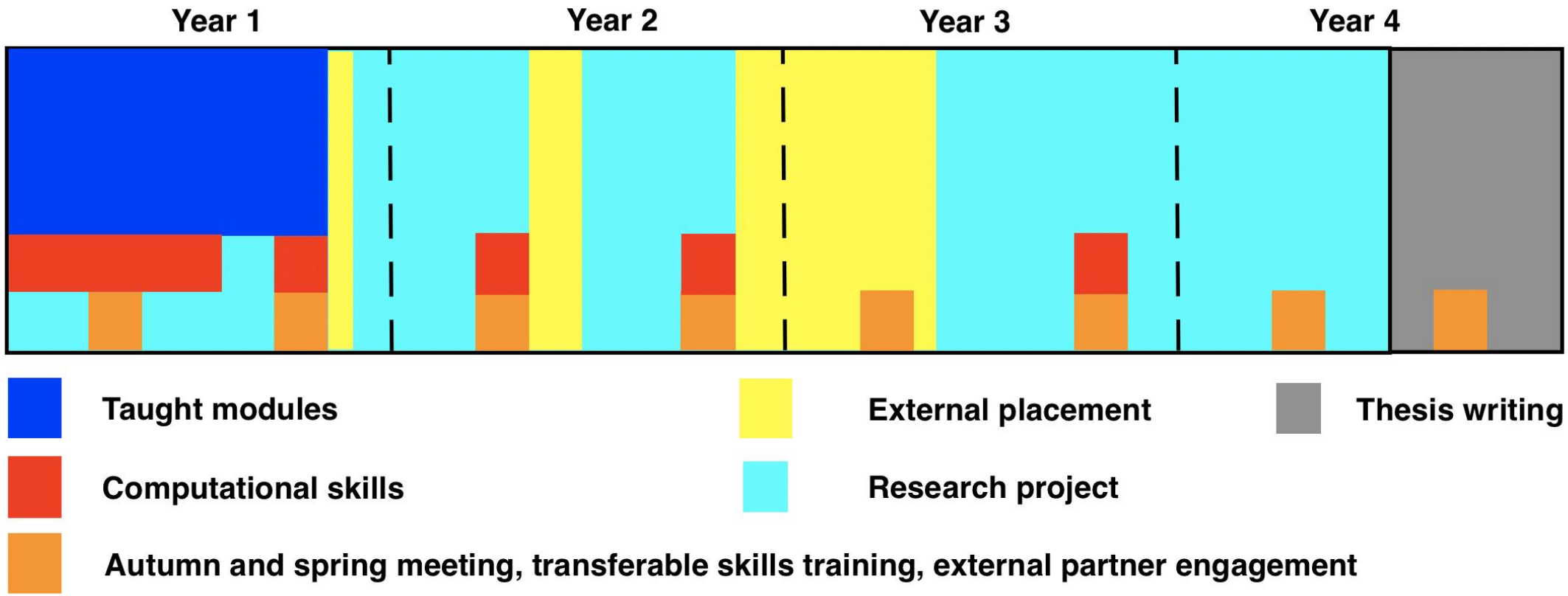
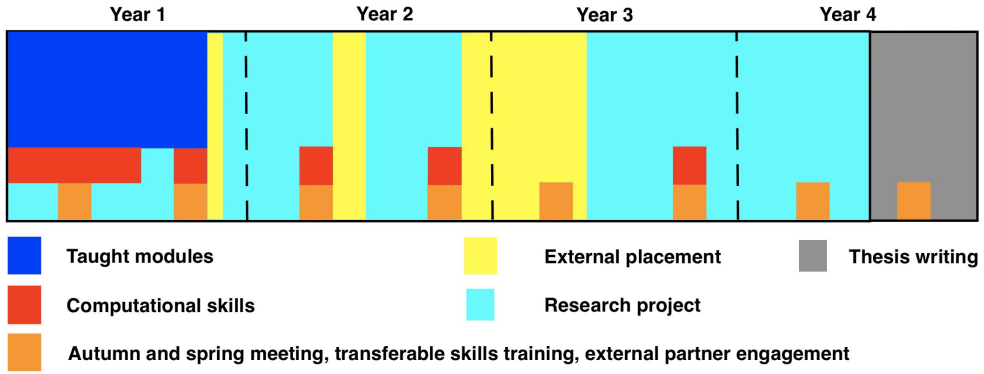
Teaching and Learning

Henning Flaecher (Bristol)

Student trajectory



Taught modules



Main principles:

- Modules delivered at the 5 partner universities
- Register once you have obtained your university email addresses
- Accessible via recorded lectures, online material
- Meet the lecturer in person at CDT events and/or via video call

- No exams at the end (you are no longer undergrads!)
- Assessment via coursework and participation
- Monitored by lecturer and CDT management team
- Part of probation, progression after 6/12 months

Year 1: modules

- Semester 1
  - Machine Learning - Bristol
  - Data Analysis - Cardiff
- Semester 1+2
  - Information Visualisation - Bangor
  - Reading and Writing Development Group - Aberystwyth
- Semester 2
  - Big Data and Data Mining - Swansea

- Research theme specific modules, in the students' home university

Module: Machine learning (semester 1)

- https://www.bris.ac.uk/unit-programme-catalogue/UnitDetails.jsa?ayrCode=18%2F19&unitCode=COMS30007

- Dr Carl Henrik Ek Computer Science Bristol University
  carlhenrik.ek@bristol.ac.uk

- Assessment: coursework assessment throughout module, submitted via Blackboard/email

- Course content public at http://carlhenrik.com/COMS30007/

- Lectures on Mon 12pm – 1pm and Tue 5pm – 6pm from 30th Sep – 17th Dec

Module: Machine learning (semester 1)

Machine Learning is concerned with three things,

1. formulate assumptions and beliefs mathematically
2. incorporate beliefs with data to support or disprove our belief
3. generate new knowledge by providing an updated belief

Course structure:

Part 1 Introduction and recap of probability theory

Part 2 Modelling

Part 3 Inference

- The **aim** of the unit is to provide you with a solid understanding of what allows us to learn from data so that you can read papers, understand new models and build your own. Importantly this unit will not provide you with a toolbox or a bag-of-tricks.

Module: Machine learning (semester 1)

Introduction: Weeks 1-2

- The first two weeks will provide a recap of the language of machine learning, probabilities. We will provide a semantic to probabilities to clarify the "misunderstanding" that probabilities are simply "frequencies of events" and provide a much richer interpretation.

Topics Probabilities, Distributions, Gaussian Identities, Conjugacy

Modelling: Weeks 3-6

- We will focus on building models, we will build more and more advanced models with the aim of communicating that the principle of machine learning is exactly the same. We will also introduce how we can look at computation as statistical inference.

Topics Linear Regression, Dual Linear Regression, Gaussian Processes, Unsupervised Learning, Stochastic Processes Dirichlet Processes, Topic Models, Bayesian Optimisation, Neural Networks, Reinforcement Learning

Inference: Weeks 7-12

- Integration is essential operation in machine learning and sadly its often very hard to do and we have to resort to approximate integration. We will look at both stocastic and deterministic approximations to integration.

Topics Laplace Approximation, Sampling, Variational Inference, Derivation of Variational Inference

Module: Data analysis (semester 1)

- https://data.cardiff.ac.uk/legacy/grails/module/PXT125.html

- Prof Haley Gomez Physics and Astronomy Cardiff University
  GomezH@cardiff.ac.uk

- 2 assessed question sheets and 1 mini project (Jupyter notebooks), weekly exercises

Module: Data analysis (semester 1)

- **The basics:** Displaying and interpreting data. Data mining, causes of uncertainty. Linear error propagation.
- **Introduction to Bayesian Foundations:** What is probability, distributions, hypothesis testing (t-tests, Mann Whitney, Kilmogorov-Smirnov test), confidence intervals; Bayes theory, priors.
- **Parameter Estimation and sampling:** Relationships between quantities, correlation; minimizing and maximizing functions, global and local minima, least squares, maximum likelihood, singular-value decomposition, Principle component analysis.
- **Sampling:** Bias, Monte Carlo sampling, pseudo random distributions, MCMC method, bootstrapping and Jack-knife samples, multivariate analysis techniques.
- **Time-frequency analysis and Image/Signal Processing:** Fourier techniques including convolution, deconvolution, filtering techniques, wavelets, Floquet modes, modulation.

Module: Information visualization (semester 1+2)

- https://www.bangor.ac.uk/computer-science-and-electronic-engineering/postgraduate-modules/ICE-4121

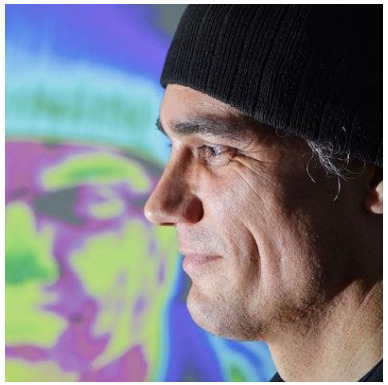
- Prof Jonathan Roberts Computer Science Bangor University
  j.c.roberts@bangor.ac.uk

- 2 Assignments in 2nd semester
  1. Design an information visualisation (on a choice of data) using the Five Design-Sheets method
  2. Implementation of your creative idea (in Processing)

Module: Information visualization (sem 1+2)

- The **history** and future of Information Visualization; the challenges of Information Visualization; tasks; user, perception, data types.
- Looking at **data**. Data capture and problems of capturing data. Selection/abstraction of data (aggregation, sampling; binning; cropping); Big data challenges.
- Understand current **visualisation techniques**, including traditional plots (bar, line, scatter etc.), parallel coordinate plots, treemaps, re-orderable matrix; scatter plot matrix.
- **Perception** and interpretation; understanding how humans perceive information. Encoding of value; Encoding of relation; Models: Bertin, Mackinlay (Quantitative, Ordinal, and Categorical), Semiotics.
- **Design of visualisations**, dashboards, and considering alternative solutions and critical analysis of these visualisations.
- I**nteraction and exploration**, looking at focus + context and distortion technique; multiple views and composite interaction; brushing; animation.

Module: Reading and Writing Development (semester 1+2)



- https://www.aber.ac.uk/en/modules/deptfuture/PGM2610/AB0/

- Prof Reyer Zwiggelaar Computer Science Aberystwyth University
  rrz@aber.ac.uk

- delivered to all students simultaneously, using video conferencing; run over both terms; schedule will be determined by you and the lecturer

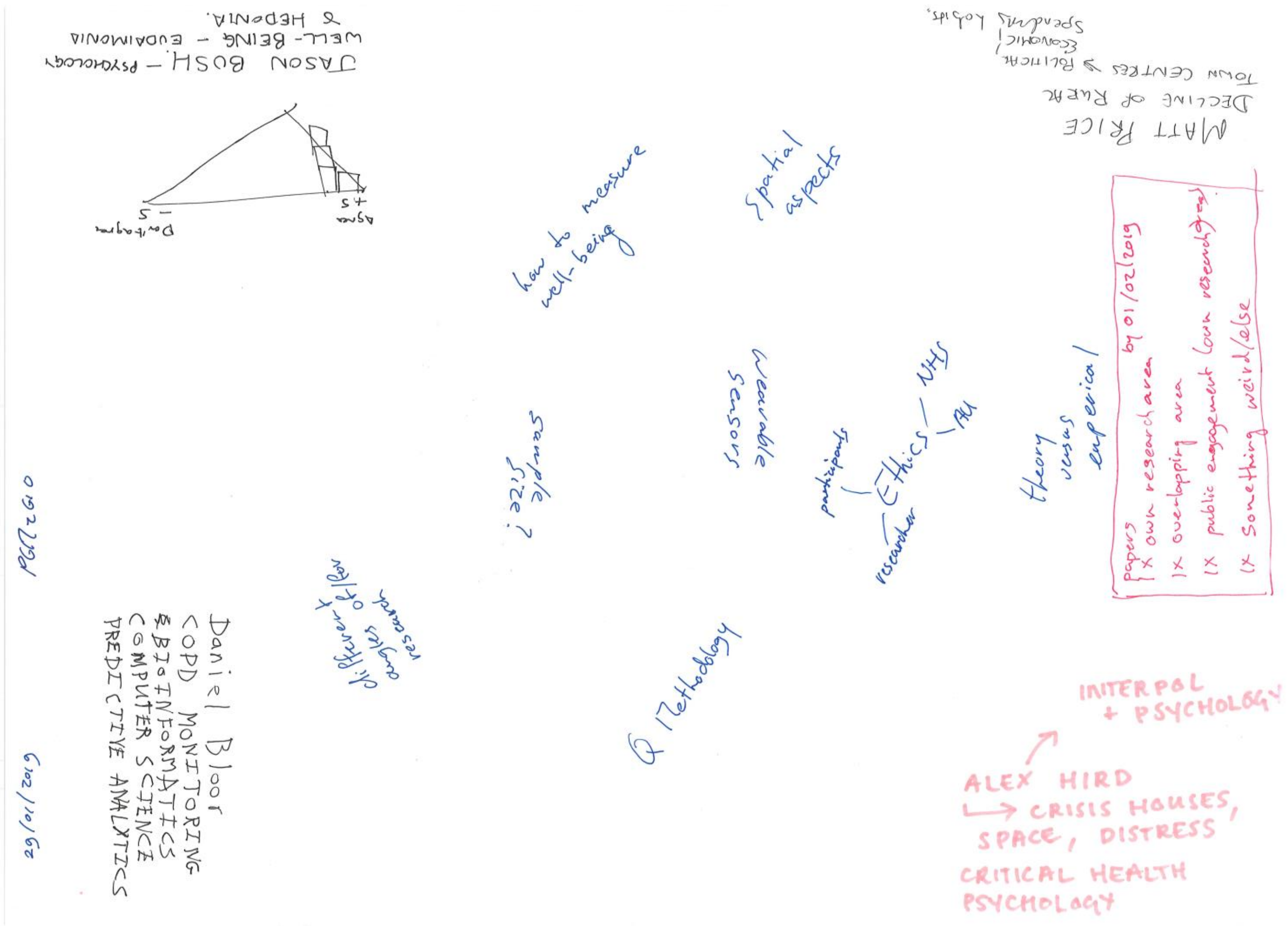
- Assessment: attendance, draft literature review, reflective essay

Module: Reading and Writing Development (sem 1+2)

- Aim is to develop the research skills of the students, with an emphasis on the critical analysis of the literature

- Identify and discuss subject specific literature
- Communicate with non-experts
- Defend points from the literature, which they might not support
- Reflect on aspects in the literature
- Critically evaluate the literature
- To write up literature review aspects

Step I


JASON BUSH – PSYCHOLOGY
WELL-BEING – EUDAIMONIA
& HEDONIA.
MATT RICE
DECLINE OF RURAL
TOWN CENTRES & POLITICAL, ECONOMIC/ SPENDING HABITS.
how to measure well-being
spatial aspects
sample size?
Wearable sensors
Ethics – NHS – AU
participants
researcher
theory versus emperical
papers by 01/02/2019
1x own research area
1x overlapping area
1x public engagement (own research)
1x something weird/else
different angles of other research
Q Methodology
PGR2GO
29/01/2019
Daniel Bloor
COPD MONITORING
& BIOINFORMATICS
COMPUTER SCIENCE
PREDICTIVE ANALYTICS
INTERPOL + PSYCHOLOGY
ALEX HIRD
CRISIS HOUSES, SPACE, DISTRESS
CRITICAL HEALTH PSYCHOLOGY

Step II

PGM2610 2018/2019 Group 2 – Schedule

Each session has three papers, as suggested by the relevant person (e.g. Alex's Own Research). In the first instance discussed by the other two people associated with the paper (e.g. Daniel & Jason), and subsequently by the proposer (e.g. Alex) and then open to the group.

05/02/2019
- Alex's Own Research Area – Daniel & Jason
- Daniel's Overlapping Paper – Matthew & Alex

08/02/2019
- Jason's Public Engagement – Alex & Matthew
- Matthew's Something Different – Jason & Daniel

15/02/2019
- Daniel's Own Research Area – Alex & Jason
- Jason's Overlapping Paper – Daniel & Alex
- Matthew's Public Engagement – Alex & Jason

19/02/2019
- Alex's Something Different – Jason & Matthew
- Jason's Own Research Area – Matthew & Daniel
- Matthew's Overlapping Paper – Daniel & Alex

12
08/03/2019
- Alex's Public Engagement – Matthew & Daniel
- Daniel's Something Different – Jason & Matthew
- Matthew's Own Research Area – Jason & Daniel

15
12/03/2019
- Alex's Overlapping Paper – Daniel & Jason
- Daniel's Public Engagement – Matthew & Alex
- Jason's Something Different – Alex & Matthew

~~15/03/2019~~
Overflow and/or Reflection/Assessment

Step III

Neuropsychiatric Disease and Treatment

Dovepress

open access to scientific and medical research

Open Access Full Text Article

REVIEW

Strategies to improve anxiety and depression in patients with COPD: a mental health perspective

Athanasios Tselebis[1]
Argyro Pachi[1]
Ioannis Ilias[2]
Epaminondas Kosmas[3]
Dionisios Bratis[1]
Georgios Moussas[1]
Nikolaos Tzanakis[4,5]

[1]Psychiatric Department, "Sotiria" General Hospital of Chest Disease, Athens, Greece; [2]Endocrinology Department, "Elena Venizelou" Hospital, Athens, Greece; [3]Pulmonary Department, "Metropolitan" General Hospital, Athens, Greece; [4]Department of Thoracic Medicine, [5]Social Medicine, Laboratory of Epidemiology, University of Crete Medical School, Heraklion, Greece

Video abstract

Abstract: Chronic obstructive pulmonary disease (COPD) is a chronic inflammatory lung disease characterized by progressive and only partially reversible symptoms. Worldwide, the incidence of COPD presents a disturbing continuous increase. Anxiety and depression are remarkably common in COPD patients, but the evidence about optimal approaches for managing psychological comorbidities in COPD remains unclear and largely speculative. Pharmacological treatment based on selective serotonin reuptake inhibitors has almost replaced tricyclic antidepressants. The main psychological intervention is cognitive behavioral therapy. Of particular interest are pulmonary rehabilitation programs, which can reduce anxiety and depressive symptoms in these patients. Although the literature on treating anxiety and depression in patients with COPD is limited, we believe that it points to the implementation of personalized strategies to address their psychopathological comorbidities.

Keywords: COPD, anxiety, depression, pharmacological treatment, psychotherapy

Introduction

The Global Initiative for Chronic Obstructive Lung Disease (GOLD) defines chronic obstructive pulmonary disease (COPD) as a disease state characterized by exposure to noxious agents resulting in airflow limitation that is not fully reversible, causing shortness of breath and significant systemic effects.[1] This definition covers a spectrum of respiratory diseases, and includes both the clinical diagnosis of chronic bronchitis and the pathological diagnosis of emphysema.[2] In clinical practice, COPD is defined by characteristically diminished air flow in lung function tests. Spirometry is required to make the diagnosis and staging in this clinical context;[3] the presence of a postbronchodilator forced expiratory volume in 1 second/forced vital capacity (FEV_1/FVC) <0.70 confirms the presence of persistent airflow limitation and thus of COPD. Unlike asthma, the limitation is practically irreversible and usually worsens gradually over time.[4] This worsening is causally related to an abnormal inflammatory response of the lungs to inhaled harmful particles or gases, attributed – usually – to smoking.[5]

COPD is a leading cause of morbidity and mortality worldwide and results in an economic and social burden that is both substantial and increasing.[6] COPD prevalence, morbidity, and mortality vary across countries and across different groups within countries. The Global Burden of Disease Study estimated that COPD will become the fourth leading cause of death and the seventh leading cause of disability-adjusted life year(s) lost worldwide by 2030.[7] The death rate associated with COPD has doubled in the past 30 years,[8] implying that the health-care system failed to address the problem.[9]

Comorbidity studies[10–12] from Western and developing countries, inpatient and outpatient population, and younger and elderly patients reveal a substantial overrepresentation of anxiety and depression in COPD, from significant symptoms to full

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doi:10.1017/S1060150310000306

THE DEAD STILL AMONG US: VICTORIAN SECULAR RELICS, HAIR JEWELRY, AND DEATH CULTURE

By Deborah Lutz

I. The Death of the Storyteller

BY THE TIME THE NINETEENTH CENTURY reached its close, it was already possible to look back at Victorian death culture with nostalgia. With the rise of secularism, the slide toward what Diana Fuss has called the death of death had begun.[1] No longer was it common practice to hold onto the remains of the dead. Rarely would a lock of hair be kept by, to be worn as jewelry, nor did one dwell on the deathbed scene, linger upon the lips of the dying to mark and revere those last words, record the minutiae of slipping away in memorials, diaries, and letters. Rooms of houses were increasingly less likely to hold remains; no one had died in the beds in which the living slept.[2] Walter Benjamin, who wrote often about what was lost in the nineteenth century, sees the turning away from death as going hand in hand with the disappearance of the art of storytelling.[3] Writing in the early 1930s, he called his contemporaries "dry dwellers of eternity" because "today people live in rooms that have never been touched by death" (*Illuminations* 94). Avoiding the sight of the dying, Benjamin argues, one misses the moment when life becomes narrative, when the meaning of life is completed and illuminated in its ending. He privileges the shared moment of death, when relatives, and even the public, gather around the dying to glean final words of wisdom, to know perhaps, in the end, the whole story. Historian of death Philippe Ariès describes a Christian account of the final ordeal of the death bed, when in the moment of death the salvation or damnation of the dying is determined, thus changing or freezing, for good, the meaning of the whole life. Scholars of nineteenth- and twentieth-century death culture tend, on the whole, to agree that towards the end of the century, a process that began earlier reached a completion – that the death of the other not only became less of a shared experience among a community, but last things such as final words and remains were increasingly to be pushed to the back of consciousness and hence to the lumber room of meaning and importance.[4]

The following paper will approach these themes, but from a slightly different angle and with a separate set of tools. Rather than the epiphanic moment of the deathbed scene explored by Peter Brooks, Garrett Stewart, and Elisabeth Bronfen and so central to the work of the

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Annals of Tourism Research, Vol. 29, No. 4, pp. 1175–1178, 2002

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Auschwitz: Museum Interpretation and Darker Tourism

William F. S. Miles
Northeastern University, USA

In an era in which publics have become more demanding of their museological experiences, visual "interpretation" has emerged as a new framework for both museum curators and their scholarly critics (Noussia 1998). This trend towards a more relevant and interactive museum pedagogy has become so transformative that some have posited the "post-museum" as a successor form to the 19th century institution (Hooper-Greenhill 2000). This emphasis on museum interpretation is particularly sensitive when applied to "dark tourism." The latter entails recreational visitation to sites "associated… with death, disaster, and depravity", such as the US Holocaust Memorial Museum in Washington DC (Lennon and Foley 1999). However, there is a difference between sites *associated with* death, disaster, and depravity and sites *of* death, disaster, and depravity. If visitation to the former is rightfully characterized as "dark tourism," then journey/excursion/pilgrimage to the latter constitutes a further degree of empathetic travel: "darker tourism."

Based on visits to the Washington museum and the (open-air) museum at the former concentration camp site of Auschwitz-Birkenau, this research note intends to underscore the significance of the distinction between "dark" and "darker" tourism (Miles 2000, 2001). Particularly with respect to authenticity, but also in terms of site interpretation, it is a distinction that needs to be recognized and internalized by those charged with commemorating the Shoah. Key to this interpretive function are the differing motivations for Holocaust memorial construction and visitation. Such a paradigm, sensitive to dimensions of authenticity and experience, may also help in assessing the varied reactions by those drawn to such sites. "Darker tourism" is conceptually and linguistically preferable to Young's (1994) unintentionally reifying polarity between "memorials removed from the sites of destruction" and "sites of destruction" *per se*. By virtue of their opposite positions in the panoply of Holocaust museums, the State Museum in Oświęcim and the Washington museum represent particularly appropriate case studies for comparison. On account of what happened there, Auschwitz has become a notorious, universal symbol of evil. That it is relatively undeveloped in terms of museum facilities or methods of representation is secondary. The US Holocaust Memorial Museum in Washington DC, on the other hand, can rightly claim to be the epitome of technological sophistication with respect to Shoah memorialization. Yet, its location on the Washington DC mall bears no connection to the events of the Holocaust *per se*.

It is useful to adopt a space-time framework in approaching the dark–darker tourism paradigm. While there is little agreement over when the Shoah began, it ended in 1945, whether it is conceived as a distinct event (the more conven-

Review Series

Chronic Respiratory Disease

Chronic Respiratory Disease
2016, Vol. 13(3) 264–283

DOI: 10.1177/1479972316642365
crd.sagepub.com
SAGE

Use of predictive algorithms in-home monitoring of chronic obstructive pulmonary disease and asthma: A systematic review

Daniel Sanchez-Morillo[1], Miguel A Fernandez-Granero[1] and Antonio Leon-Jimenez[2]

Abstract

Major reported factors associated with the limited effectiveness of home telemonitoring interventions in chronic respiratory conditions include the lack of useful early predictors, poor patient compliance and the poor performance of conventional algorithms for detecting deteriorations. This article provides a systematic review of existing algorithms and the factors associated with their performance in detecting exacerbations and supporting clinical decisions in patients with chronic obstructive pulmonary disease (COPD) or asthma. An electronic literature search in Medline, Scopus, Web of Science and Cochrane library was conducted to identify relevant articles published between 2005 and July 2015. A total of 20 studies (16 COPD, 4 asthma) that included research about the use of algorithms in telemonitoring interventions in asthma and COPD were selected. Differences on the applied definition of exacerbation, telemonitoring duration, acquired physiological signals and symptoms, type of technology deployed and algorithms used were found. Predictive models with good clinically reliability have yet to be defined, and are an important goal for the future development of telehealth in chronic respiratory conditions. New predictive models incorporating both symptoms and physiological signals are being tested in telemonitoring interventions with positive outcomes. However, the underpinning algorithms behind these models need be validated in larger samples of patients, for longer periods of time and with well-established protocols. In addition, further research is needed to identify novel predictors that enable the early detection of deteriorations, especially in COPD. Only then will telemonitoring achieve the aim of preventing hospital admissions, contributing to the reduction of health resource utilization and improving the quality of life of patients.

Keywords

Algorithms, asthma, chronic obstructive pulmonary disease, decision support systems, exacerbations, hospitalization/statistics, machine learning, prediction, predictive analytics, physiological measurements, predictive analytics, pulmonary disease, telemedicine, telemonitoring

Introduction

Asthma and chronic obstructive pulmonary disease (COPD) have attracted research interest as a major public health problem of increasing concern to healthcare systems worldwide because of high prevalence[1] and rising socioeconomic burden.[2,3]

Reducing the impact of exacerbations through the early recognition of symptoms and prompt treatment may reduce the risk of hospitalization, improve

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Email: daniel.morillo@uca.es

Module: Big data and data mining (semester 2)

- https://intranet.swan.ac.uk/catalogue/default.asp?type=moddetail&dept=any&mod=CSCM35&ayr=19%2f20&psl=TB2&detailOnly=false

- Dr Jingjing Deng Computer Science Swansea University
  j.deng@swansea.ac.uk

- Assessment: 4 coursework assessments

Module: Big data and data mining (semester 2)

- This module introduces students to the fundamental topics of data mining, including data pre-processing techniques, applied probability and statistics, data mining algorithms (incl. associate rule, classification, clustering, outlier detection and probabilistic graphical model), and big data frameworks

- Course Overview and Python Programming for Data Science
- Mathematics Background: Numerical Analysis, Applied Probability and Statistics
- Frequent Pattern, Association, Correlations
- Naïve Bayes Classifier, Quantitative Evaluation
- Decision Tree, Random Forest, AdaBoost
- Maximum Likelihood Estimation, Expectation Maximisation
- Clustering, DBSCAN, High Dimensional Data Analysis
- Text Data Analysis, Word2Vec, Skip-Through, CBOW
- Time-Series Data Analysis, Regression, Hidden Markov Model
- Scalability and Efficiency Big Data Analysis

Scientific libraries, e.g. NumPy, SciPy, Scikit-Learn, Matplotlib, Tensorflow, Hadoop, Spark.

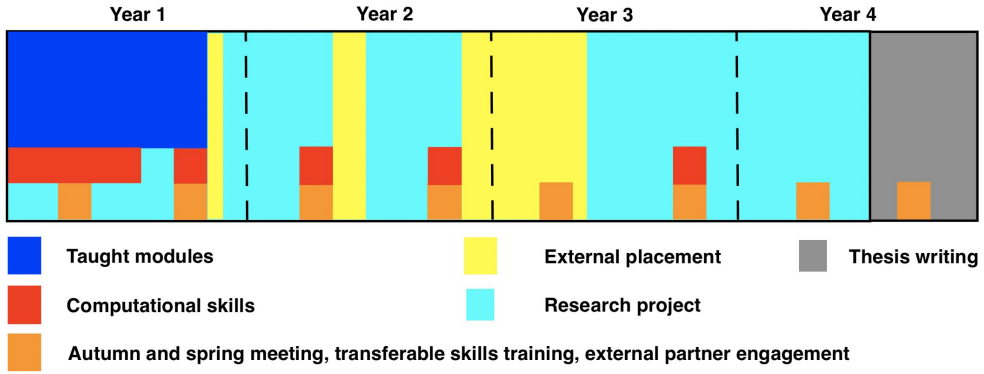
Research-specific modules

In addition, you should take research–specific modules at your university, relevant for your research topic, e.g.

- Machine Learning for Intelligent Systems (Aberystwyth)
- Virtual Environments & Human Perception (Bangor)
- Statistics for Particle Physicists (Bristol)
- Gravitational Waves (Cardiff)
- Machine Learning in Healthcare (Swansea)

This is arranged in discussion with your supervisor, local PGR coordinator

Taught modules



Recap:

- No exams, but coursework and assessments
- Registration with other universities overseen by CDT management, once you have your university email addresses
- Take advantage of what is on offer!

Any questions?

Transferable Skills Training

Delivered throughout the programme, via inter/intra cohort meetings

- Communication, critical thinking, unconscious-bias, EDI, impact
- Workshops via the Alan Turing Institute (later years)
- Leadership, grant writing, public engagement
- Management and financial planning skills
- Thesis writing, employability, careers

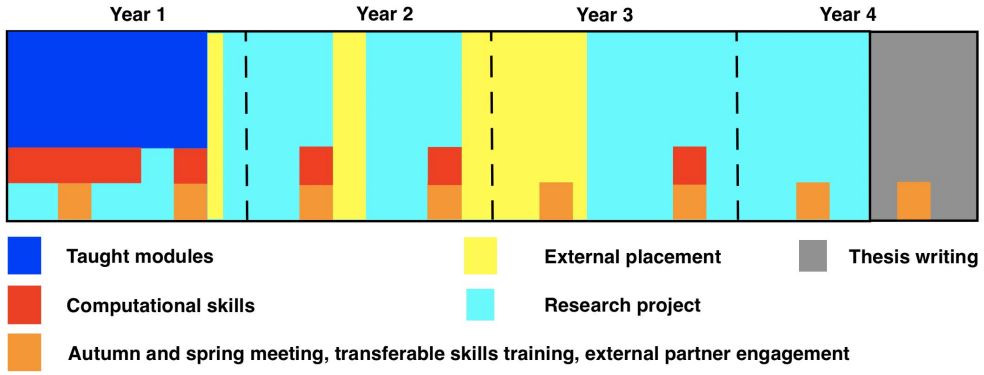
- Training/workshops led by industrial partners

Delivery

- Two-day residential meetings to meet lecturer, work on open problems, exchange experiences
- Software Carpentry sessions (computing skills)
- Cohort-building activities/transferable skills during autumn and spring meetings, mentoring via experienced CDT students

Schedule to be planned shortly, with your input

Annual meetings



Two meetings per year for all students,
external partners, supervisors

- All cohorts and external partners invited, networking and feedback
- Autumn meeting:
  - welcome to new cohort
  - Pairing of students with external partners
  - Mentoring, feedback, transferable skills, …
- Spring meeting: annual conference
  - Science! oral and poster presentations, best poster prize
  - EDI, RI, industrial research presentations by external speakers
  - Mentoring, feedback, transferable skills, …
- Stakeholder board and External Board meetings

Responsible innovation/equality, diversity & inclusivity

Best practice and pro-active actions

Reyer Zwiggelaar (Aberystwyth)

Responsible Innovation – Induction Event

- Responsible research in the global context – societal responsibilities, plagiarism, falsification, collaboration
- Issues of integrity – individual and institutional responsibilities
- Data management – sharing data, open access, medical data
- Research ethics – human participants, animals, health
- AI and ML specific aspects – bias, transparency
- Case studies

Responsible Innovation – Subsequently

- Reflect on which RI issues may arise
- Two-page report
  - Written in the spring
  - Part of the end-of-year progression
- Explicit example of RI in the context of AI
  - At spring meeting
- Peer learning/reflection in later years

Input from external partners on RI in non-academic environments welcome, for example via presentations at annual meetings

Industrial and external placements

Industrial Placements

- Indicative 6 month placement in industry, public sector or commerce around the end of the 2nd or during the 3rd year
  - Work on an AI/ML/AC project, e.g.,
    - Novel ML models applied to industrial data
    - Applications of multi-agent systems for decision making
    - data analysis and large-scale calculations
  - Relevant to the company and not necessarily part of the Ph.D. project
  - Benefit to the student: applying gained knowledge in industrial contexts
  - Benefit to the company: availability of unique skills to solve a problem relevant to them
- Shorter placements in 1st/2nd year (1 month)

How is the CDT related to industrial applications?

Research areas of the CDT:

- Machine learning applications to advanced fundamental science contexts: relevant for industrial applications in which speed, volume, variability etc. are challenging
- Medical applications: immediate relevance in related industrial contexts
- Novel algorithms and methods: give the possibility to transform and disrupt ways of operating with data

Wrap-up

- Questions, questions, questions?