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[Machine Learning Yearning (NG, 2019): Libro, Autunno 2020-Inverno 20-21….Quaderno Blu 12](#__RefHeading___Toc72738_486667654)

[Developin’ Analytic Talent (Becoming a Data Scientist) (V.Granville, 2014) Primavera 2022 (libro) 14](#__RefHeading___Toc72740_486667654)

[Math and Stats for Web Analytics and conversion Optimization ( H. Sharma 2015): Libro Estate 2022 14](#__RefHeading___Toc72742_486667654)

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[Data Science on AWS Implementing End-to-End, Continuous AI and Machine Learning Pipelines (Chris Fregly, 2021): Libro Estate 2022 14](#__RefHeading___Toc72746_486667654)

[Amazon Web Services in Action (A. Wittig, 2022): Libro Estate 2022 14](#__RefHeading___Toc72748_486667654)

[Artificial Intelligence for Dummies (A. Wittig, 2022): Libro Inverno 23 14](#__RefHeading___Toc72750_486667654)

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[Feller Probability 1: Libro, Inizio Estate ’22. Quaderno Rosso (I) sez stat Mat 16](#__RefHeading___Toc72760_486667654)

[Introduction to Statistical Learning, G. James, D. Witten, T. Hastie .R. Tibshirani (2nd ed 2015): Libro, Quaderno Rosso (I) sez. stat Mat. 16](#__RefHeading___Toc72762_486667654)

[Pattern Recognition and Machine Learning (Bishop 2006): Quaderno blu e Note Onyx 16](#__RefHeading___Toc72764_486667654)

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[Hands on Machine Learning (Book, Autunno 2022): Quaderno Rosso I sezione AI Data Science 19](#__RefHeading___Toc72780_486667654)

[Inferenza Statistica Chiandotto (2017): Libro, Tablet Samsung 19](#__RefHeading___Toc72782_486667654)

[Doing Bayesian Statistics with R and WinBugs: 19](#__RefHeading___Toc72784_486667654)

[Reinforcement Learning (Sutton, 2018) Estate 2023, Quaderno Rosso I 19](#__RefHeading___Toc72786_486667654)

[Leti, Statisica descrittiva (…)Autunno 2020-Inverno 20-21…. 20](#__RefHeading___Toc72788_486667654)

[Serverless Analytics with Amazon Athena (Book, Autunno 2022)…Quaderno Rosso sezione AI Data Science 20](#__RefHeading___Toc72790_486667654)

[Neural Networks for pattern Recognition (Bishop 2006): Libro, (estate 2022) Quaderno blu e Note Onyx 20](#__RefHeading___Toc72792_486667654)

[Deep Learning MIT: Libro, Es su quaderno Rosso. (Estate 22…. 20](#__RefHeading___Toc72794_486667654)

[Introducing Data Science: Big data, machine learning, and more, using Python tools: Libro, Quaderno rosso (Estate 22…. 21](#__RefHeading___Toc72796_486667654)

[Piccolo Statistica (1998-2010): Libro, Quaderno “Piccolo” blu + file Notes Autunno 2020 21](#__RefHeading___Toc72798_486667654)

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[Mit: Calcolo Multivariato Corso: Inizio Estate ’22. Quaderno Rosso Sez Mat 24](#__RefHeading___Toc72826_486667654)

[Mit: Equazioni differenziali Corso: Inizio Estate ’22...Quaderno Rosso Sez Mat 24](#__RefHeading___Toc72828_486667654)

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[READ Economics Finance 24](#__RefHeading___Toc72846_486667654)

[Options trading Quick start guide: Libro Estate ‘22 24](#__RefHeading___Toc72848_486667654)

[STUDIATO APPLICATO Economics Finance 24](#__RefHeading___Toc72850_486667654)

# READ Algoritmi e Computer Science

## How Computers Work: the evolution of Technology (R. White, 2015): Libro

### First Part: What Makes a Computer a Computer

#### Ch1:Onde Longitudinali, onde traverse e tipi di vibrazione. Lunghezza di onda amplitude. Frequenza (Hertz)

Onde elettormagetiche…si muovono su un piano trasversale. (Non sono meccaniche e possono muoversi nel vuoto doppio campo…magnetico ed elettrico). In che modo l’informazione viaggia sulle onde?

Codice morse (frequency modulation FM) and Amplitude Modulatin (AM) Pulse modulation sulle onde convenzionali. Pulse modulation la più nuova nasce con l’info trasmessa con i nuovi modem ma va bene solo per testo ed immagini. I sengali analogici si possosno trasportare solo con AM e FM (Se no nsi convertono in segnali digitali). A maggiore frequenza consiste maggiore quantità di info.

Voltaggio, Amperaggio, Resistenza (Ohm). Conduttori, Semiconduttori, Isolanti. Cavo che genera campo magnetico e cavo in mezzo ad un campo magnetico. Controllo corrente. Step up transformer e Ste Down Transformer. Resistori (Resistori Variaibli tipo manopola volume). Capacitors.

In che modo i computer (ri)creano il mondo con i numeri. Segnali analogici e segnali digitali.

Fotocamera digitale…image sensor. Analog to digital converter e digital to analog converter.

Trasistor and it’s working,.

Ch2: How Computer Remember**:** Transistor. Processors and bit (16 32 64). Logical Gates. Positive charge. Software sends electrical charge along RAM chip attached to transistors that switch on or off. Capacitors. Combo of 1 and 0 from eight data lines give a byte of data. DDR RAM. Clock rate halved with DDR2.

Flash Memory

#### Ch3 How Little Computer does big things:

Transistor. Processors. Process do math on registers of 32 or 64 bits activated with electricity (ALU…arithm logic unit). Memory data register

Not Gate, Or Gate, And Gate, Xor Gate…cambiano a seconda della posizione e del comportamento dei transistor. LE loro combo permettono la math.

HowProcessors Move Data: Info enters through BIU (Bus Interface Unit). Branch Target Buffer. JEU

Multi core silicon chip. Hyperthreading (thread operations). Os put operations in queue. Desktop CPU use complex instructions set computing

Mobile CPU keep it simple (Reduced instructions set computing)

#### Ch 4 How Motherboards Conduct a Symphony of Data**:**

resistors to keep heat; capacitors che rendono disponibile l’elettricità all’oocrrenza; microchip e circuit traces; sockets. Bus. Bios…first component to come into life. PCI express. Chipset combining north and south bridge. North bridge and memory controller. Front side bus.

South Bridge handle traffic between input and output devices

PcI express (scalable) to manage heavy demand PCI and AGP. Braking data into packets (cyclic redundancy check). Chipset. Lne mechanism to distribute data.

### Second Part: Software..Storia OS e programmi più roba leggera sui nuovi dispostivi

#### Ch 5 How Words are stitched into programs: different programming languages

Software Construction…interpreters compilers. Assembly hexadecimal modiy regristrers (AX registrer..increase by one)

Kernel and routines…parsing (copia e riusa stringhe di codice)

Branching

## How Computers Work (R. White, 2007): Libro

# STUDIATO APPLICATO Algoritmi e Computer Science

## Python Crash Course (E. MAtthes, 2015): Libro iniziato Inverno ‘20-’21. Quadernone rosso (II) - Windows

### First Part:

#### Ch **1** Getting Started

Ch2

Variable and Data Types + es…uppercase, lower es 2.5, 2.7, 2.8

#### Ch 3Lists and their manipulation

sort list es 39

#### Ch 4Working with lists

…loop over lists, Numerical Lists es 4.1 4.6 4.8 ..Tuple, line length (<80)

#### Ch 5 IF STATEMENT: c

heck eq, ineq, elif es 5.2, 5.3, 5.4

#### Ch 6 DICTIONARIES..creating, adding elelments, modifying values es 6.1,6.2, looping

Through a dictionary…key value paird es 6.4, es6.6, ;List of dictionaries; list IN dictionary. Dictionary in Dictionary

#### Ch 7 Input and while loops

…int per numeric input da usare come numero, modulo; quit; break; flag; continue…inifintie loop…dictionary in list…commando pop() per rimuovero oggetti dalla lista

Ch 8

8.1 (Message), functions returning dictionaries, with while…optional args ex 8.3, 8.5, 8.7, 8.8, 8.9, arbitrary number of args 8.12, 8.13…importing module and function as whole

#### Ch 9Classi

fino methods (functions)…instances es 9.1, 9.3. Init method, methids instances, attributes. Cr Class.Value modifying through method.Es. 9.4, 9.5. Inheritance

## How to Think like a Computer Scientist, Learning with Python 3, 3rd Edition (2017): Libro iniziato con il corso MIT Python (Autunno 2020) - Windows

#### Ch 1 The way of the program

…prime definizioni e linguaggio pantheon

## Intro to C B.Kerningham (20??)

## Learn Java The Easy Way (2018 )

#### Ch 1Eclispse set up

#### Ch2 Java project…random number…class

## Introduction To Algorithms Cormen 3rd ed..5) Quadernone Rosso (II) - Linux

#### Ch 1 …

#### ….

#### …

#### Ch 4

…Yield e concetto di constructor iterante in una lista (cfr link in varie)

## Algorithms for dummies (Mueller Massaron…) Quadernone Rosso (II) - Linux

#### Ch 1 …

#### Ch2 …

#### Ch 3 …

#### ….

#### …

Ch 7 Relying on hashing (147-152)…

first hash function with array of numbers…md5 and sha algorithm in python

Creating hash tables…Avoiding collisions…Partial Values, folding, Mid-Square….Open Addressing, Rehashing..Chainign. SHA; RSA…..Locality sensitive Hashing… e’ il modo in cui le compagnie mettono insieme info e soprattutto riescono ad attribuire nomi simili (ma non uguali) allo stesso oggetto (Los Angeles los angeles etc….).

Dictionaries are example of hash functions.

Ch 12 (Managing with big data)…

Moore’s law. Big Data and source of (Astronomy, Meteorology, Physics, Genomics)

## Python GUI ProgrammingCookbook (Meier 2017)

Sentdex Gui btc

Gui Programming buttons label loop…call functions

## Occupy The Web, Linux Basics for Hackers Getting Started with Networking, Scripting, and Security in Kali (2018, No Starch Press): Libro, iniziato Inverno 21Quadernone rosso (II) - Linux.

Ch 1

Linux file system; Basic commands..pwd, whoami, etc, whereis;locate; piping between programs…grep; ps aux; cat to create file (and mofiy); touch….cp file;

Getting Started:Binaries…Terminal..Linux File System (no physical drive like windows) Pwd; whoami,cd;ls; ls –l;…hidden ls –la Every file has an help…tipo airchrack-ng –help (aircrakc wireless cracking tool). Nmap –h …portscanning (anche -?)

Manual man commando per alcune tool.

Locate …trova lle cose. (flaw …upadated just once a dy…può tnon trovare cose appena messe

Whereis.

Whch find bibnary in path

#### Ch2

… rm files …rm –r di

#### Ch 3 …

#### Ch 4 …

## MIT Intro to CS and Programming (Python): Corso iniziato autunno 2020, Quadernone Rosso (II) - Windows

### Video Lectures

1. (2008) Getting Started …imperative and declarative knowledge
2. Declarative (quale è la radice di x? E lo dichiari); Imperative (Descripton of how to do something); Semantic; Flow of control2 (2016-2008)
3. 8 (2016) OOP…class inheritance methods blueprint self \_\_init

### Readings

1. **(Slides1 corso 2015)…** problem solving knowledge etc…Machine architecture

Primitive …Turing showed that you can compute anything using 6 primitives

anything computable in one language is computable in any other programming languageRecipe: seps+flow of contro+mean of determingn when to stop

1. (Slides2 corso 2016)…+codes in 2 2016 e modifiche
2. (Slides8 corso 2016)…+codes in 8 2016 e modifiche su OOP
3. **READINGS 2008** **GitHub**

### Assignemnts

i. In class questions 1 (2016)

ii. In class questions 2

iii. Problem set 1 (House Hunting)

iii. Ass0 2008

iv. Problem set 2 (Hangman su wordlist.txt)

## Computer Science E-1 (*Understanding Computer & The Internet*): Corso Iniziato Inverno 2022, Quadernone Rosso (II) - Windows

### Video Lectures/Readings

### Lecture 1: Hardware

### Lecture 2: Hardware, continued

### Lecture 3 i

nternet P1: Network of network, IPs,IPv4, IPv6…NAT, DHCP,Speed;DNS, DNS hierarchy, DNS Hijackingm, DNS Records, TLD, URLs, Browser Requests

### Lecture 4:

internet P2 Mail, Protocols, Http Requests GET method and POST method, HTTP(s) requests and responses. Mails SMTP, Queues and Stacks, EMAIL headers, POP3, IMAP, PHIShing; TCP fundamentals, segment, ACK, IPs and routing tables, datagrams or packets, Network Masks, subnet masks, subnetworks, UDP, % laer internet model 6

#### Lecture 5: Multimedia

….file extensionsraster Graphic pixels,Colors (RGB scale, hexadecimal denomination) additive model, subtractive model (CMYK, scale). Bitmaps, Resolution enhancing..Losseless compression, lossy compression. Vectro Graphics, Seam Carving (Content Aware Scaling). Sound (Wavelegnth, amplitude, frequence). Wave interference (in phase out of phase) Digital Sound, sampling, bitrate. MP3 Files….frequency masking…psychoacoustic…spectrogram. AAC format. 3d grpahics. Mesh, Wireframes. Video, codec container, compression. Streaming, GPU

### Problem Set

1,2,3,4,5 (1,2 Mahalan update)

### Video Lectures

## CS50 Intro to CS: Corso Iniziato Estate 2022, Quadernone Rosso (II) - Windows

### Video Lectures/Readings

* Lecture 0: Scratch and algorithmic Thinking
* Lecture 1: C…Compilers, loops, do while, break…overflow…calculator, %s,%i,….headers libraries

### Problem Sets

* PS0 Scratch...da fare
* PS1...fatto hello con input

### Video Lectures

## CS50 Intro to CS with Python: Corso Iniziato Estate 2022…Quaderno Rosso (II) - Windows

### Video Lectures/Readings

* Lecture 0: Functions, Variables…Hello, pop title, strip, comandi o meglio programmini in cui ci sta la main function (nel main chaimi una finzione che definisci dopo)...conversione str to float...problema di overflow
* Lecture 1: CONDITIONALS…if else, or…modulo…match case
* Lecture 2: LOOPS while, for, dictionaries…Mario
* Lecture 3: EXCEPTIONS Runtime errors, try-except-else, pass,
* Lecture 4 Libraries: random, statistics, command line arguments, pakages, API

### Problem Sets

* PS0 ..input, emoticon...float string etc…
* PS1 .. Deep Thoughtm Home Federal Savings Band, File Extension Meth interpreter Meal Time
* PS2 .. camelCase, Coke Machine,Just setting up my twttr, Vanity Plates, Nutrition FactsPS3 …fino ad outdated che mi ha fatto diventare pazzo…try except continue while
* PS 4

## Java Tutorial: Corso YouTube, Tablet Samsung, Quadernone rosso (II) e Tablet Samsung - Winodws

[**https://www.youtube.com/watch?v=xk4\_1vDrzzo&t=2797s**](https://www.youtube.com/watch?v=xk4_1vDrzzo&t=2797s)

Variables; swap two variables creandone una terza; user input; expressions; gui intro con finestra che chiede dati;math class varie operazioni; random numbers; if statements;

## Head First Java 2nd ed.: Libro iniziato Estate ‘23. Quadernone rosso (II) e Tablet Samsung - Winodws

### First Part:

#### Ch 1:

#### Ch 2:

#### Ch 3:

#### Ch 4:

#### Ch 5:

## GIT and GITHUB, Quadernone Rosso (II) - Linux

## Algorithms for dummies

# READ Web Hack Internet

# **The Internet Book\_ Everything You Need to Know about Computer Networking and How the Internet Works-CRC Press (D. Comer, 2018):** Libro (Autunno Inverno 20-21)

## Hacking..computer Hacking, Penetration Testing and Basic Security (G.Hall, E.Watson, 2016): Libro ….

### PART I: Into the world of Hacking

Ch1 What is hacking**…**  skills needed CS skills, networking skills, DB skills, Linux, Scripting

Virtualization soft pack, security concepts PKI SSL, Reverse Engineering Skills

#### Ch 2 Hacking and Basic Security……

#### Ch 3 the Ethcal Hacking Plan

#### Ch 4 the Hacker MEthodology

## The Art of Invisibility (K. Mitnicj, R, Vamosi, 2017): Libro …..

### PART I: Into the world of Hacking

#### Ch1

## Don’t make me think (S.Kruk 2013-14…. Revised Version)

#### Ch1 Don’t make me think…

#### Ch2 How we really use the Web. We scan Pages; not optimal choices satsifacion.

## How The Internet Really Works (2019): Libro Inverno 21-22

Ch1 How is the internet Networked?Network of networks; Servers accept connectiosn; type of networks; centralized direction, Decentralized, distributed; Media Access Control; DHCP; packets…segnali elettrici, onde radio o segnali ottici. Protocolli e coemcomunicano I device su internet (TCP, UDP, QUIC)

Ch2 Packets, What are packets Made of…Transmitting Packets

# STUDIATO APPLICATO Web Hack Internet

## HTML CSS JS for Web Developers: Corso (Ref…. Cartella in ….), Quadernone Rosso (II) - Linux

## Django Tutorial: Corso, Quadernone Rosso (II) - Linux

## Learning PHP, JS and SQL: Libro, Quadernone Rosso (II) - Linux

# READ Statistics ML Data Science

## Machine Learning An applied Math intro (P.Wilmott 2019): Libro, Inverno 21-22 (Quaderno Rosso I)

#### Ch 1 Intro

Ch2 General MattersJargon m data scaling, Dimens, PCA, Conf Matrix and relative measures of fitting…Math methods; LM; NLP Bayes; Info Theory and Entropy

#### Ch 3 KNN as classification and Regr problem

#### Ch 4 K means Clustering

#### Ch 5 SVM: Hard Margins (Lagrange Multiplier Version) , Soft Margins, Gradient descent, Polar coordinates, Kernel trick

Ch10 Neural Networksfeed fwd. Universal Approx Theorem. Activation Function; classification. Back prop, Auto encoder, LSTM.

Ch 11 Reinforcement Learning: Jargon: Action reward punishment, State, MDP; Blackjack example. Value Function, Policy; Multi armed bandit. KNOWN ENVIRONMENT..Transition Probabilities…Goal or return….discount factor…maze…markov chain problem.State Value function…Action Value function. Bellman Equations. Optimal Policy; Mont Carlo Policy Evaluation…Temporal Difference learning;FINDING OPTIMAL POLICY: SarsA, Q-Learning

## Machine Learning Yearning (NG, 2019): Libro, Autunno 2020-Inverno 20-21….Quaderno Blu

#### Ch 1 …

#### Ch2 …

#### Ch 3 …

#### Ch 4 …

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**..**

Ch 13-19 Error Analysis…looking at dev and test set; check differnet sources of error and correct those which are more recursive (intervieni là). Alcune cose le puoi fare manualmente. Balckbox e eyecheck dev set

Ch 20-27…Bias and Variance…If performance on training is 15% error rate and dev set is 16% error (84 accuracy) we break error in 2 com.

Error rate in training BIAS.

Surplus of error on dev set (+1%) Variance

Optimal Error Rate (Bayes erro Rate )…il benchmark che ci dice di quanto possiamomigliorare.

If train error smaller than optimal…overfitting on the train set.

#### 23 Addressing Bias and Variance

Here is the simplest formula for addressing bias and variance issues:

If you have high avoidable bias, increase the size of your model (for example, increase the

Size of your neural network by adding layers/neurons). If you have high variance, add data to your training set

Control overfitting with Regularization (L2 etc…). Occhio sempre al tradeoffo bias Variance (Regularization increase the bias but reduce variance, arricchire il modello di layer neruoni reduce bias ma aumenta varianza.). Miogliori tutto con nuove architetture.

Come riduciamo bias (avoidable). Size model increase. REmove regularization. More data help on variance but not on bias.

Come riduciamo varianza. Aggiunta dati, regualrization…early stopping. Riduci features. Decrease model complexity. Modify input features based on error analysis. Modify model architecture.

LEARNING CURVES…

Ch 28: decreasing curve until desired error rate. (Human level performance)

Ch 29 Plotting training error.

Ch 30: Interpreting learning curves: High bias

#### Ch 31: Interpreting learning curves: Other cases…sempre trade off bias variance con dev and training error

#### Ch 32: Plotting learning curves

COMPARING TO HUMAN LEVEL PERFORMANCE

#### Ch 33: Compare to human level performance for benchmark

#### Ch 34 P

#### Ch 35:

TRAINING AND TESTING ON DIFFERENT DISTRIBTIONS:

#### Ch 36: Mix images from internet and original

#### Ch 37:

iN GENRALE dipende dalla dimensione della tua rete se inserire molti dati…chiaro che se no è sufficientemente grande ed hai immagini che non c’entrano un cazzo è meglio lasciarle fuori

#### Ch 38:

Qui dice una cosa inconcepibile…non includere dati di case in un’altra città…Magari non ho capito bene io ma è una BELLA CAZZATA… (solita distinzione ML Econometrics)

#### Ch 39:

Weighing data if your dataset have totally different sizes. (And distributions)

#### Ch 40:

Training and dev/test distrib…. bad performance algo. High bias (bad on training set); high variance (ok training, bad on new data). Ok on new data with same distrib as training but not on other from dev/test distrib. (DATA MISMATCH)

#### CH 41

#### Ch 42:

#### Ch 43:

#### Ch 44:

#### Ch 45:

#### Ch 46:

## Developin’ Analytic Talent (Becoming a Data Scientist) (V.Granville, 2014) Primavera 2022 (libro)

Data Scientist vs Statistician vs Business Analyst. Applications in Real World Scenarios…

Analytics vs seduction. Analytics is get from Multivariate testing and segmentation (segmentation by ISP)

Check if data are missing (or incomplete) or censored (gun example). Hidden Data

Pag 28 Amazon sales increase with better relevancy. Conditional probabs

## Math and Stats for Web Analytics and conversion Optimization ( H. Sharma 2015): Libro Estate 2022

## Ch1,

Ch2

Ch 3

Ch 4

## Data Science on AWS Implementing End-to-End, Continuous AI and Machine Learning Pipelines (Chris Fregly, 2021): Libro Estate 2022

Ch1,

Ch2

Ch 3

Ch 4

## Amazon Web Services in Action (A. Wittig, 2022): Libro Estate 2022

## Artificial Intelligence for Dummies (A. Wittig, 2022): Libro Inverno 23

Ch1,sette tipi di intelligenza; 4 modi di definire la AI.Usi della AI

Ch2 role of data

Ch 3

Ch 4

## Artificial Intelligence a Modern Approach (Norvig, 2022 4th ed.) Book…

### **Part 1**

#### **Ch 1**

Intro… Acting and Thinking Humanly NLP, knowledge Repr., Automated Reasoning, ML+ Robot: Computer Vision, Robotics (physical interaction)…introspection, psychologic experiments, brain imaging. Thinking and acting Rationally….

filoni AI, Math, Filosofia, neuroscienze, economia, psicologia, Math, Computer engineering, Control Theory and Cybernatics, Linguistica…Storia della AI, state of the ART, Rischi e benefici

#### Ch2 ….

Problem Solving

#### Part Solving problems by Searching:

### Knowledge reasoning and planning

#### Ch 7 Logical Agents

**Machine Learning**

#### Ch 19 Learning from examples

### **Part VI**

#### **Ch 24...**

# STUDIATO APPLICATO Statistics ML Data Science

## Deep Learning Silvestri: Corso, PHD Autunno 2023…Quaderno Rosso (I), Linux

### Video Lectures/Readings/Notes

#### **Lecture 1**: Intro and applications of AI

#### **Lecture 1**: Tree search, Uninformed Search

#### Lecture 2:

#### **Lecture 10/11: MDP I:**

#### Lecture 10/11: MDP II:

#### Lecture …RL1

#### Lecture …RL2

### Problem Sets/ Notes

Worksheet 1 (2023):Torre di Hanoi, definizioni di spazio degli stati e dimensione; search algo in action

Exam prep 1: Pacman and SpongeBob; snail search for love…simple search and search con due passaggi

Project 0…un po’ di roba con python…autograder et al

## Neursocience Academy: Corso, Autunno 2023 Quaderno Rosso (I) - Linux

### Video Lectures/Readings/Notes

#### **Lecture 0**: I

#### **Lecture 1**:

#### Lecture 2:

#### **Lecture 10/11: MDP I:**

### Problem Sets/ Notes

* Worksheet 1 (2023):Torre di Hanoi, definizioni di spazio degli stati e dimensione; search algo in action
* Exam prep 1: Pacman and SpongeBob; snail search for love…simple search and search con due passaggi
* Project 0…un po’ di roba con python…autograder et al

## Feller Probability 1: Libro, Inizio Estate ’22. Quaderno Rosso (I) sez stat Mat

#### lect **1**

#### lect2

## Introduction to Statistical Learning, G. James, D. Witten, T. Hastie .R. Tibshirani (2nd ed 2015): Libro, Quaderno Rosso (I) sez. stat Mat.

4.4 LDA. 4.4.1, 4.4.2 Classification with bayes; lda for p=1 44.3 lda for p>1

#### Tree Based Models

pruning…choose alpha with k fold CV 8.1.2 Classification tree…tree vs linear and tree advantages.

#### **8.2 Bagging Random Forres Boosting**

Bootstrapp aggregation …out of bag estimation Variable importance measure…8.2.2 Random Forrsts…decorrelate tree 8.2.3 Boosting

## Pattern Recognition and Machine Learning (Bishop 2006): Quaderno blu e Note Onyx

#### Ch 1

Bayesian fitting…model selction…cross validation…curse of dimensionalityDecision Theory…classification, Bayes. Miss classification rate. Expected Loss. Decision and inference…**1.5.5.** Loss function for Regression problems. **1.6**…Information Theory…Entropy, bits..maximum and minimum entropy. 1.6.1. Relative Entropy and KL sddistance…mutual info between vars (ex 1.1-1.6,1.13, 1.14.1.15,1.17,1.20)

#### Ch2 Prob. distributions:

2.1 Binary; 2.2 Beta as prior for binomial; Multinomial dirichilet

#### Ch 3 …

#### Ch 4 …

## Deep Learning (Bishop 2023):

#### Ch 1

#### Ch2 Prob. distributions:

#### Ch 3 …

#### Ch 4 …

## Understanding Deep Learning (Prince 2024):

## Deep Learning (Bangio 2017):

## Probabilistic Machine Learning (Bishop 2024), Vol 1:

## Probabilistic Machine Learning (Bishop 2024), Vol 2:

## CS188 Intro to AI Berkeley: Corso, Estate 2023…Quaderno Rosso I

### Video Lectures/Readings/Notes

#### **Lecture 0**: Intro and applications of AI

#### **Lecture 1**: Tree search, Uninformed Search

(Depth, Breadth, Search, Unifrom Cost Search) Reflex Agents (Consider how the world is); Planning Agents (Consider how the world would be).

Search Problem (State space, Successor Function, Start and Goal; Solution). State Space Graphs and Search Trees.

Properties. Completeness, Optimality, Time, Space.

#### Lecture 2:

#### **Lecture 10/11: MDP I:**

Non deterministic search. Rewards to be maximized. (set of States, set of Actions, Transition Function, Reward Function, Start State, Terminal State). Policy…sequence of actions or goals. Discounting. Stationary preferences. Utility, sequence of discounted reward.

#### Lecture 10/11: MDP II:

#### Lecture …RL1

#### Lecture …RL2

### Problem Sets/ Notes

* Worksheet 1 (2023):Torre di Hanoi, definizioni di spazio degli stati e dimensione; search algo in action
* Exam prep 1: Pacman and SpongeBob; snail search for love…simple search and search con due passaggi
* Project 0…un po’ di roba con python…autograder et al

## The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Second Edition (Springer Series in Statistics) Hastie Tibshirani et al (2nd ed 2016)

## 

#### **Ch 1** Intro

#### Ch2 ….

## Python for Data Science, (Mueller P, MAssaron L 2019) Estate 22….Quadernone Rosso (I) - Linux

#### Ch.1. Intro

**…**definizione di Data Sceince e pipeline… **Ch.2**

#### **Ch 2.** Perché usare Python..prototyping (creare applicazioni etc...)

#### Ch.3. Installazione etc…not relevant

#### **Ch.4. Reviewwing Basic Python**

operatori varii; aritmetica,,,operatori unari; Boolean express.; operatori del tipo *in, not in* (Membership operators); *is..is not* ( Identity operators)…datetime etc…

SETS: comodi per fare unione intersezione etc…import set from Sets..liste etc

#### Ch.5. Working with Real Data:

updating streaming and Sampling Data. Dati non strutturati tipo immagini..interazione con rdms…sqlalchemy…noSQL db (Mongo..cmq solita storia connection)

Estrapolazione e manipolazione dati su internet

#### Ch.6. Conditioning Data

## Intro to Python® for Computer Science and Data Science:Learning to Program with AI, Big Data and the Cloud by Paul Deitel & Harvey Deitel: Libro, Estate 22…Quaderno Rosso

#### Ch.1. Intro to computers and Python

Moore’s Law…Computer organization (Input, output units; Memory; Arithmetic Logic Unit; Central Processing Unit; Secondary Storage Unit; Data Hierarchy. Bits, Characters, (Unicode…UTF8 encoding, ASCII), Fields, Records as collection of fields (tipo database), Files (group of related record), Database (Relational in tables con Records; and fields; Big Data; Machine Languages (Machine dependent), Assembly Languages (Assemblers, Translator Programs) and High Level Languages (source code, translated by compiler and Interpreters); Intro to Object Technology, reusable software components, attributes (modular approach structured programming), class and methods, instance of a class, method call attributes, inheritance, OOAD (Obj Oriented Analysis design); OPERATING SYSTEMS li sai; PYTHON standard and data science libraries; type of errors…logic, runtime exectuionetc…INTERNET AND WWW..Arpanet, TCP, Network of Networks (TCP/IP set of protocols), WWW, Cloud tech, mashup. IoT; SPOFTWARE TECHNOLOGIES Refactoring that is making the code clearer, Design Patterns, Cloud Computing; HOW BIG IS BIG DATA…Big Data Analytics. Volume, Velocity, Variety, Veracity; example of a big data mobile application. AI intersection of CS and Data Science.

#### Ch 2. Intro to python programming.

VARIABLES AND ASSIGNEMNTS Statements; Arithmetic; Function print and intro to quoted Strings, escape sequences (\n, \t \\ \” \’) …triple quoted string.

#### Ch.3.

#### Ch.4

#### Ch.17. Big Data: Hadoop, Spark, NoSQL and IoT…

## Intro to Time Series Forecasting (J.B.)Estate 22

#### Ch.1.Python Environment

e tutto quello che ci sta intorno (librerie..pandas, scikit learn, scipy, statsmodels e setups vari su linux mi raccomando

Ch 2. The essentials of time series forecasting…

describing and predicting..Times series Analysis and Forecasting….Time series components…Level, Trend, Seasonality, Noise..Concerns of forecasting: Data Availability; time Horizon; updating forecasting or remain static?; required temporal frequency…

Ch.3. Time Series as Supervised Learning:

ovviamente la serie è funzione di una componente deterministica ed una stocastica….diamo una struttira alla parte determinstica con dei predittori e modelliamo la parte stocastica. Sliding Window (Univariata e multivariata...uno o più steps).

Ch.4 Load and Explore Time Series Data

birth dataset. Load, size…opzioni sul read:\_csv (parse, squeeze…index:\_col..squeeze – series not dataframe); descriptive stats.

Ch.5 Basic Feature Engineering

tipo estrarre date giorni mesi ore...considera che puoi estrarre ogni tipo info dalla data...ora, minuti we, non we etc...Lag time series (shift). Rolling window (con media e previsione) idem per expanding window.

#### Ch.6 Data VisualizationLine Plot...Histogram and density...Box and whisker plots; Heat Maps. Ch 1 …

#### Ch2 …

## Hands on Machine Learning (Book, Autunno 2022): Quaderno Rosso I sezione AI Data Science

Ch.1.….

Ch 2. The … …

Ch.3.: …..

## Inferenza Statistica Chiandotto (2017): Libro, Tablet Samsung

Ch 6. …Variabilità oggettiva vs variabilità virtuale; nucleo e kernel della distribuzione a posteriori. MCMC; bayesiani soggettivisti, bayesiani oggrttivisti; distribuzioni a priori coniugate.

## Doing Bayesian Statistics with R and WinBugs:

Ch.1.….

Ch 2. The … …

Ch.3.: …..

## Reinforcement Learning (Sutton, 2018) Estate 2023, Quaderno Rosso I

#### Ch.1. Intro:

Computational approach to learning..examples…chess, GO etc…ELEMENTS OF RL (policy, reward signal, value function, value estimation, model of environmentstate) metodi evolutivi…ex 1.1-1.5…history of RL (optimal control trial and error, TDL…TDL + OPTIMAL CONTROL = WATKINS 1989)

#### Ch.2. …

#### Ch.3.

## Leti, Statisica descrittiva (…)Autunno 2020-Inverno 20-21….

#### Ch 1 …

#### Ch 2

#### ….

….

#### Ch 5 …

#### Ch 6 Rappresentazioni grafiche

## Serverless Analytics with Amazon Athena (Book, Autunno 2022)…Quaderno Rosso sezione AI Data Science

## Neural Networks for pattern Recognition (Bishop 2006): Libro, (estate 2022) Quaderno blu e Note Onyx

Ch 1**:**

Immagini 256\*256…riconoscimento classficiazione aree di intersezione …regression; curse of dimensionality...pre processing, feature extraction..polynomial curve fitting..penalizzazione...bayes e area di decsione che interseca. Decision Boundaries. Minimizzazione rischio

#### Ch2 …

#### Ch 3 …

#### Appendix B…integrale di normale

## Deep Learning Bengio et al….

Ch.1. Intro…

Sfida per AI è riuscire laddove non si riesca a formalizzare il contesto (es...facile con gli scacchi meno con il linguaggio)...deep learning...strati di conoscenza basilari sui quali costruire conoscenza maggiormente complessa. Knowledge base approach to AI. Statistical Learning..the way you deal with data depends on data rep….esempio piano cartesiano e coordinate polari..*Representation Learning* (mapping not only from input to output ma within input…autoencoder…avrei anche detto un cluster). Individuare I *factors of variation* più o meno latent. Il deep learning resolve alcune complessità legata rappresentazione e interazioni. Immagina cosa fa la sequenza di layer ad un’immagine..il primo ad ese identifica i bordi, il secondo gli oggetti, etc---fasi del deep learning: connectionism, cybernetics..linear models e limiti tipo non cattura la funziione XOR...neuroscientific...connectionism or parallel distributed processing..distributed representation. Dataset size increased; model size increased; The largest contest in object recognition is the ImageNet Large Scale Visual Recognition Challenge (ILSVRC) held each year. NLP; pedestrian recognition; turing machine; reinforcement learning;

Ch 2. Linear Algebra: tutto

standard…parte interessante quella su Eigendecomposition; SVD; Moore Penrose Psudoinverse; Traccia; Determinante (funzione che mappa matrice a scalare): PCA (Prova a farla con d>1)

Ch3:

Ruolo della probabilità nelle scienze: degree of belief...approccio frequentista, approccio bayesiano ; variabili casuali e distribuzioni di prob...condizionate marginali etc...chain rule per probabilità condizionate P(a, b, c) = P(a | b, c)P(b, c); Indipendenza, momenti; distirbuzioni note..Bernoulli, multinoulli ; Gaussian; Exponential and Lapalace (sharp peak at a point mi). Dirac distribution for the empiricalcdf; mixture of distribution and latet variables universal approximator; sigmoid, softplus (integrale della sigmoide); Bayes rule..distribuzioni e spazi di misura; Teoria dell’info (eventi scontati hanno poco contenuto informativo e viceversa). Unità di nats (bits or shannons)...KL distance to compare distirbutions cross entropy; structured probabilistic model quando ho variabili che interagiscono (non tutte) tra loro. Diretti; indiretti

#### Ch4:

## Introducing Data Science: Big data, machine learning, and more, using Python tools: Libro, Quaderno rosso (Estate 22….

**Ch.1. Intro…**Tipi di dati. Strutturati, non Strutturati, Natural lang, Machine Generated , Grpah based, Audio Video etc Streaming....Sequenza in un progretto di data science: sei passaggi: setting il goal; trovare e preparare i dati; esplorare i dati (più che altro i legami tra variabili); modellare i dati; presentazione dei risultati

Ecosistema dei big data: *distributed file system*: Hadoop. Scaling (Eithr vertical or Horizontal); *Distributed programming framework; Data integration framework* (Apache..simile a ETL in traditional data warehouse); *Machine Learning Fraameworks; NoSQL DB* differenti tipologie di datacase emersi….colonna, document stores streaming…grafi etc…; *Scheduling tools; Benchmaking tools; System deployment; Service programming; Security*

**Ch**

## Piccolo Statistica (1998-2010): Libro, Quaderno “Piccolo” blu + file Notes Autunno 2020

#### Ch2 …

#### Ch 3 …

#### Ch 4 …

#### Ch 5 …

Ch 6 Rappresentazioni grafiche**:**

Considera anche I modi di riscalre le variabili e I riferiemtni che se li cambric cambia quello che dici

#### Ch 7

#### Ch 8

#### Ch 9 Rappresentazioni grafiche: Teoria Delle V.Casuali 9.1, 9.2, 9.3 Definizioni e variabili casuali continue e dìscrete; 9.4, 9.5 fino a pag 308 funzione ripartizione.

Ch 11.7Normale MV

Ch 14: Campioni casuali e distribuioni di campionamento. Inferenza, popolazione campione spazio paramerico. Conoscere la popolazione vuol dire conoscere la var cas di riferimento. Stima, test, Intervallo di confidenza (momenti o fasi dell’inferenza) Teoria delle decisioni statistiche

**Distinzione var casuali discrete e continue circa strazione senza ripetizione.**

**Distribuzione del campione** e delle funzioni ad esso legate. (Statistiche, stiamtori o statisitche test – a seconda dellì’ambito). Statisitche campiopnarie dalla mgf.

#### Ch 15: Teoria degli Stimatori…

fino a pag 540…Teoria degli stimatori…sufficienza fattorizzazione e statistica d’ordine…cfr quaderno blu

#### Ch …

#### Ch 18 **Test Parametrici e non**

**18.1**  Intro circa il discorso prametrico o meno (ci sta la posizione intermedia per la quale conosco i momenti della v.c o le sue caratteristiche asintotiche…

**18.2**  **Test sui parametri di una V.C Normale...**su media e varianze nota l’una o l’altra; test su differenza medie… in cui se le varianze sono incognite abbiamo il test di student (test esatto); se il test non è esatto abbiamo il test diWelch; test sui campioni appaiati (variazione nella stessa unità statistica); test del rapporto di varianze (F di fisher...test di omoskedasticità)

**18.3**  **Test Non parametrici:** test DEI SEGNI primo test 1710 (arbuthnot per accertare c he l’abbondanza di nascite maschili su quelle femminili fosse il risulttato della divna provvidenza). Si sfrutta il fatto che la mediana sia oggettivamente il centor di una distribuzione o le v.c. rango che indicano il posto corrispondente che la v.c occupa nel momento in cui di ordina la stessa. Test ranghi e segni hanno un’efficienza relativa asintotica. TEST DEI SEGNI: verifica mediana o se i campioni provengono dalla stessa popolazione avendo differenza mediana nulla; formulato sulla binomiale si usa l’apporssimazione normale della stessa. TEST DEI RANGHI CON SEGNO DI WILCOXON equivalente non parametrico del test di student su un campione ..lavora sulla mediana ...valori critici su tavole. (ss ricorre alla approssimazione normale per la somma di v.c. indiepdenti e somiglianti; TEST do MANN; WHITNEY e WILCOXON

confronto due campioni di numeorosità generica e quidni distribuzioni

ANOVA (Fisher anni ‘20) nome corretto dovrebbe essere analisi delle medie in più di due gruppo mediante il confronto tra devianze. I fattori sono le condizioni che variano...i trattamenti;

disegno a blocchi randomizzati o non randomizzati a seconda che si assegni il trattamento casualmente o meno; a effetti fissi o casuli o aleatori; bilanciato disegno o meno;test parametrici o non assumenodo per i parametrici la normalitadegli errori sperimentiali

Si fonda sulla decomposizione della varianza

Statistica test è un rapporto della varianza between sualla varianza within.

**18.4 ANOVA** si basa su 3 assunzioni: Normalità errori verifcabile dai dati campionari (se non rispettata o passi a metodi non param o rimuovi la causa della non normalità con trasformazioni dei dati);omogeneità delle varianze: va da sé; indipendenza ed omogeneità degli effetti

ANCOVA declinazione dell’ANOVA nella quale viene anche inserita una variabile esplicativa qantitativa o anche la MANOVA nella quale la variabile di risp è un vettore

**18.3 Test sulla frequenza di un attributo**

#### Ch 21.3 Metodi Ricampionamento

Jacknife intervalli di confidenza JN; Bootstrap (Efron 1979) Stima distorione, Stima della Varianza, Intervalli di Confidenza; Metodo del Percentile; Metodo BC

## Class Notes Ebhar: Libro, Quaderno blu + file Notes

#### Ch 3 Random Variables

## Deep Learning for Dummies, Quaderno BLU (Mueller P, MAssaron L 2019)

#### **Ch 10…CNN…** **Lanet Architecture**

#### Ch 11…RNN

**…** Modeling sequences using memory; speech translation; image recognition….vanishing gradient if something is redundant within the architecture solution is the LSTM architecture…attention mechanism

## Applied Predictive Modelling … , (Kuhn 2019) ) Inverno -21….

**PART 2**

**Ch. 5 Check theory**

**Ch 6** Laying Linear Regression Foundations…esempi di linear regression in python

Sklearn preprocessing and split…Onehot encoder.. .Polynomial regressors

Print(R2)…. Binary response…ricordati di convertire a 2 d array (one col and row in n )

Coefficient in logistic and estimated probabiites…overfitting….

**Ch 7 Introducing Art Neural Net …check theory studio AI ML**

**Ch 8…Building Basic NN…**steps modules; half moon separation. Choice of activation linear function..optimizer..learning rate..chek file su facendo

**Ch 9…Moving to deep learning…**check STUDIO

## Master Machine ….J.B

## Sql Tutorial...Quadernone Blu

## <https://www.youtube.com/watch?v=HXV3zeQKqGY>..

## 

## Introduction to Metanalsys in stata: sito https://stats.idre.ucla.edu/stata/seminars/introduction-to-meta-analysis-in-stata/

Effect Size; alpha ;power; N and how are related. Quality Checklist.

collecition, research question , grey literature. Inclusion and exclusion criteria.

sensitivity and specificity. (limits)

Missing Data. (N, p values etc…)

Effect size for continuous outcome the d class and the r class; Effect size for dichotomus: tisk ratio, odds ratio, risk difference.

Data inspection and descriptive statistics. Wighting; Heterogeneity :Q, Tau T squared I squared.

Meta Regression…Fxed Effects Random…selection criteris

Meta Reg in Stata…

Funnel Plot…Publication bias

## Deep Learning (Chollet )

# READ Matematica

# STUDIATO APPLICATO Matematica

## Mit: Calcolo 1

## Corso: Inizio Estate ‘22 (Ref book: Simmons G., Calculus with analytic geometry; Appunti) Quaderno Rosso Sez Mat

Lect1: Derivate e tassi di variazione.pdv geometrico; pdv fisico

lect2: Limiti e continuità

Ch 3

**Ps1, ch1 del libro…**numeri coniche funzioni distanze etc…funzione sempre somma di due funzioni pari e dispari...formule trigonometriche e di prostaferesi

Ch 4I

## Mit: Calcolo Multivariato Corso: Inizio Estate ’22. Quaderno Rosso Sez Mat

lect **1**

Mit: Calcolo 1

lect **1** Getting STarted

lect2 Variable and Data Types + es…uppercase, lower es 2.5, 2.7, 2.8

## Mit: Equazioni differenziali Corso: Inizio Estate ’22...Quaderno Rosso Sez Mat

lect **1 isocline level curve direction fields…existence and uniqueness**

lect2

## ZWIRNER 1:

## Libro: Inizio

## ZWIRNER 2:

## Libro: Inizio

## ZWIRNER 3: Libro, quaderno rosso sezione Mat…

## Libro: Inizio

## Concrete Mathematics

## Libro: Inizio

# READ Economics Finance

## Options trading Quick start guide: Libro Estate ‘22

Ch1: tipi di opzioni; buyer, seller/writer; broker; market maker; options clearing corporation; option industry council

lect2: Trading fundamentals: call vs put...time value

Ch 3

Ch 4I

# STUDIATO APPLICATO Economics Finance