



UNIVERSITÀ DEGLI STUDI DI MILANO
DIPARTIMENTO DI INFORMATICA

Bootstrap day 2023-2024

*Presentazione CdL
Informatica Musicale*

Federico Avanzini

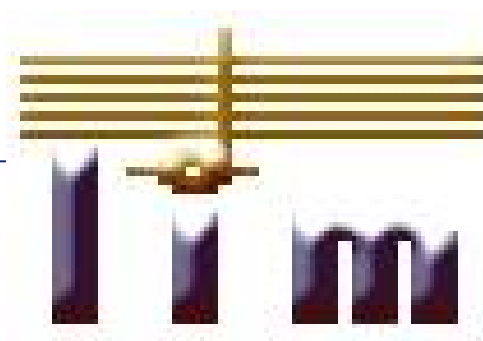


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Un po' di storia

- 1985: fondazione del LIM
- 2002: CdL “Scienze e Tecnologie della comunicazione musicale”
- 2010: CdL “Informatica Musicale”
- 2018: Il “nuovo” LIM

<https://www.lim.di.unimi.it>





Laboratorio di
Informatica
Musicale



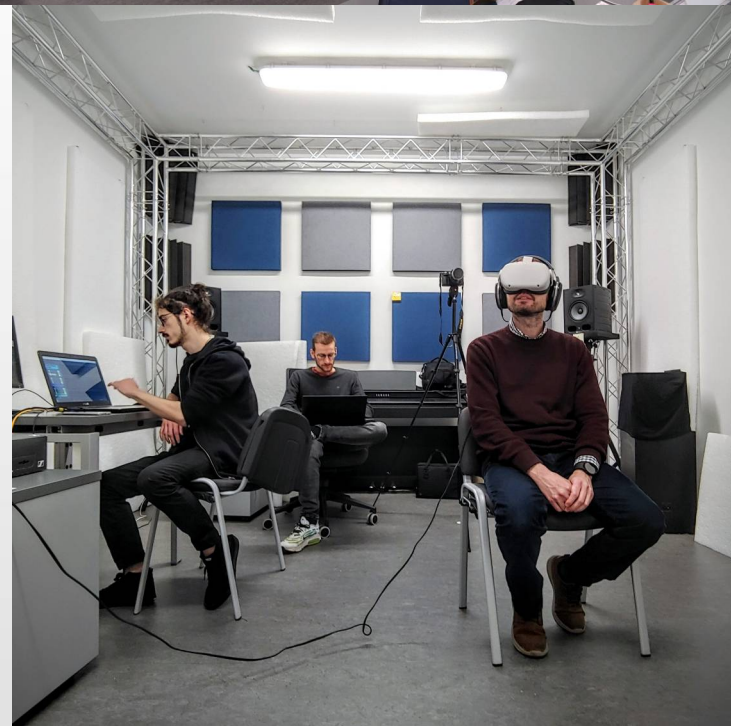
www.lim.di.unimi.it



www.youtube.com/@LimUnimi



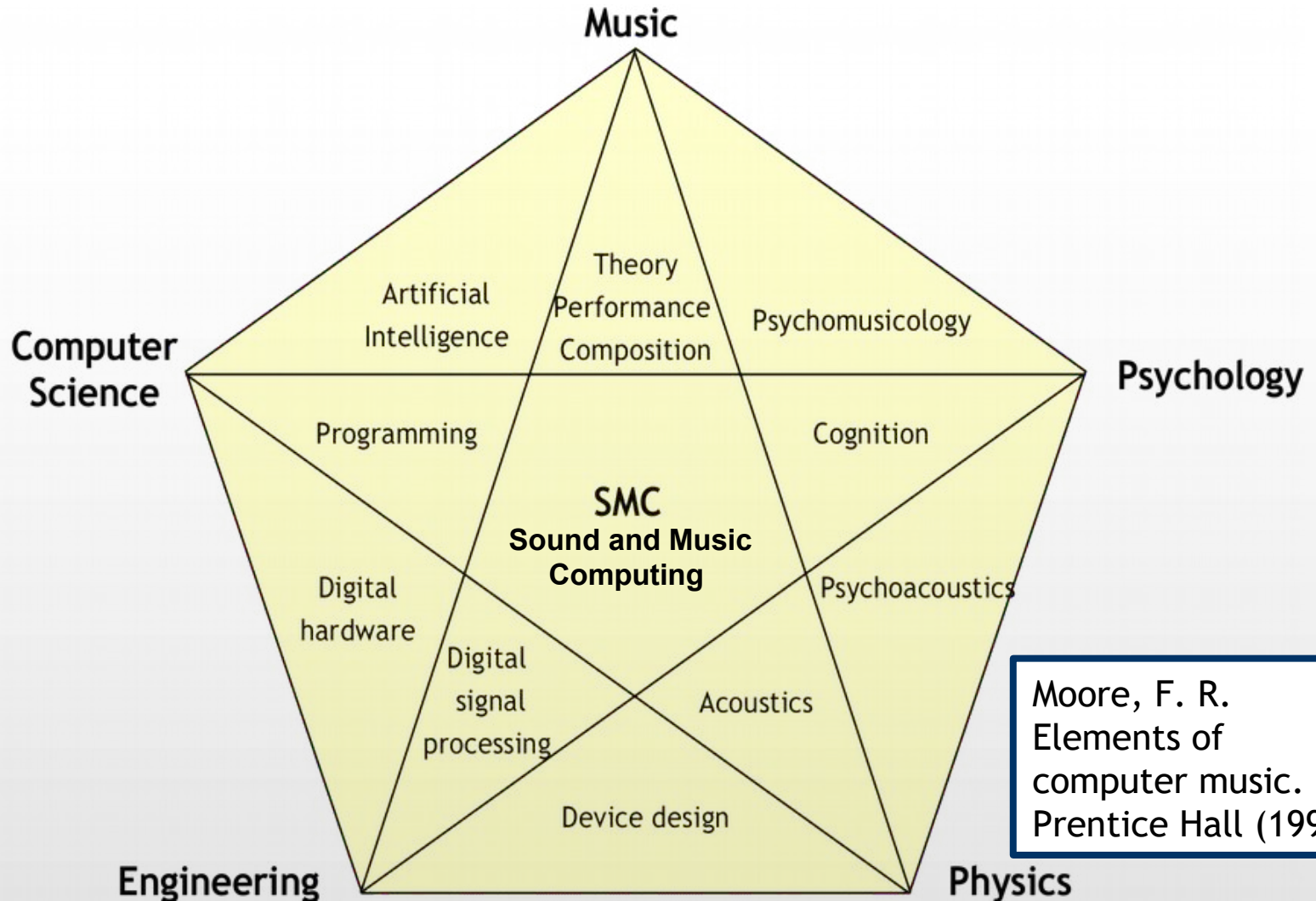
Il LIM in 120 secondi
<https://youtu.be/tVOsKiraqDs>



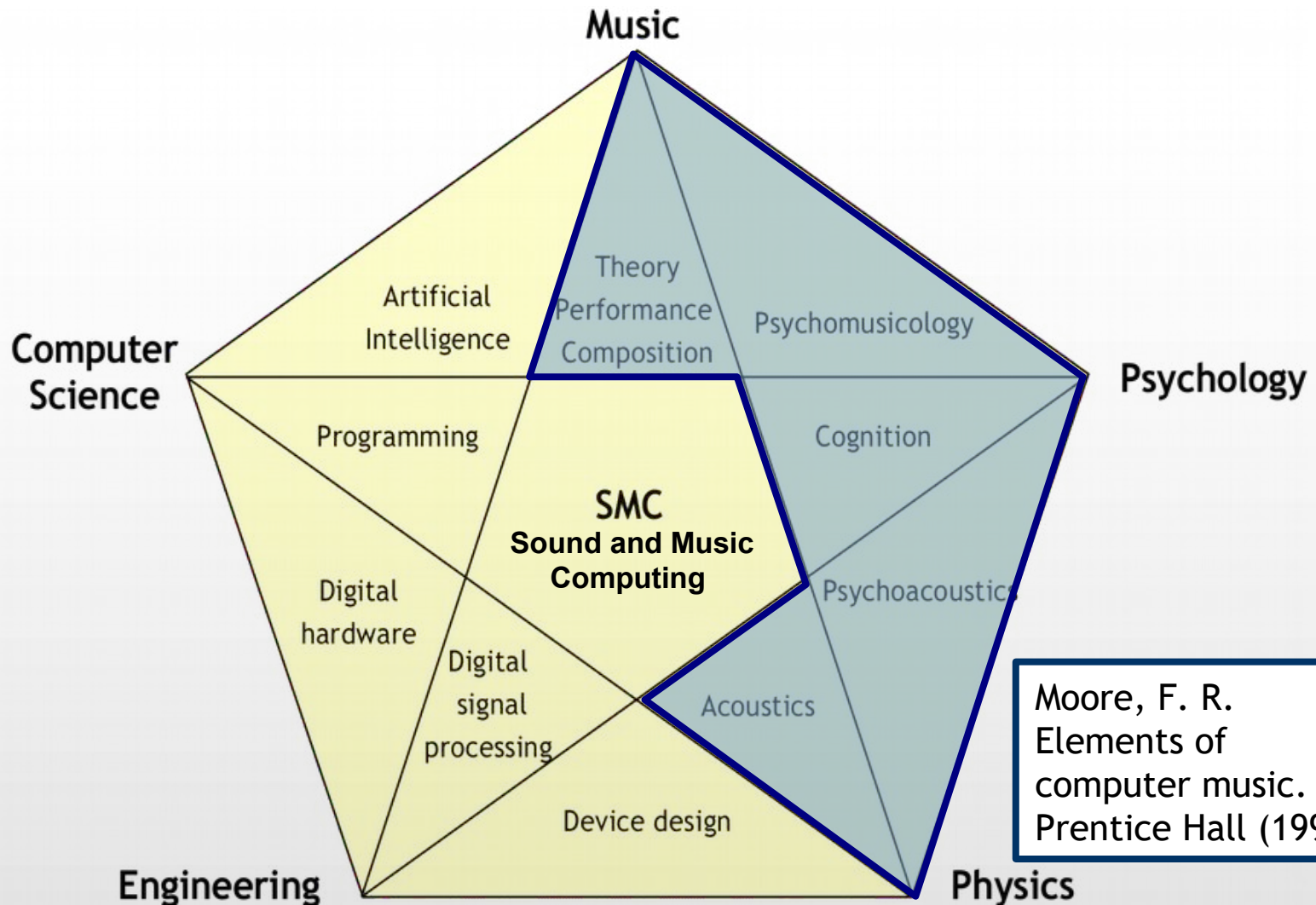
Cos'è l'informatica musicale

AKA Sound and Music Computing

i III Informatica Musicale



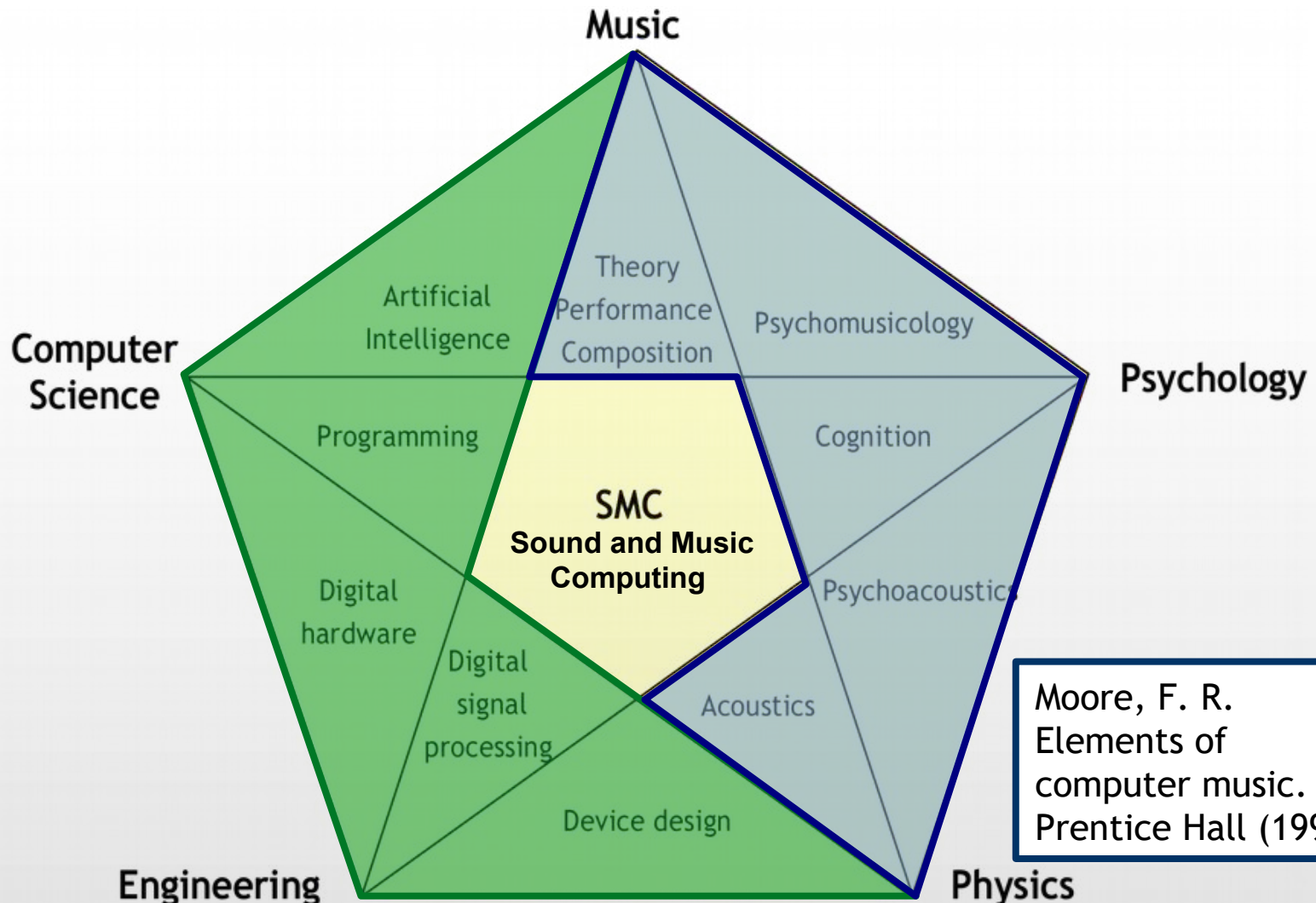
i III Informatica Musicale



Moore, F. R.
Elements of
computer music.
Prentice Hall (1990)



i III Informatica Musicale

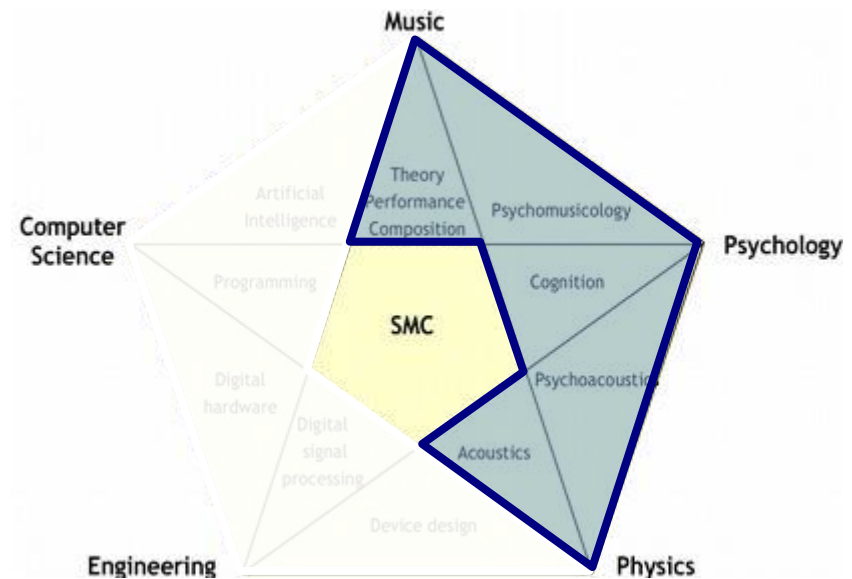


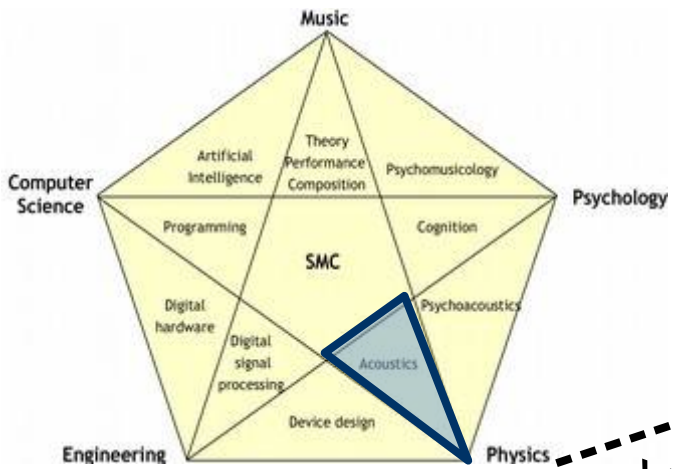
Moore, F. R.
Elements of
computer music.
Prentice Hall (1990)



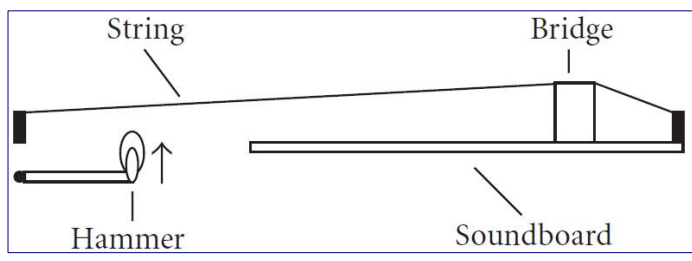
SMc

Sound and Music ...

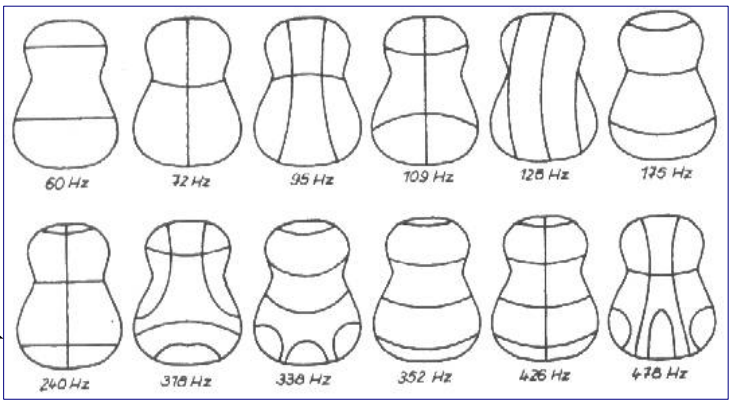




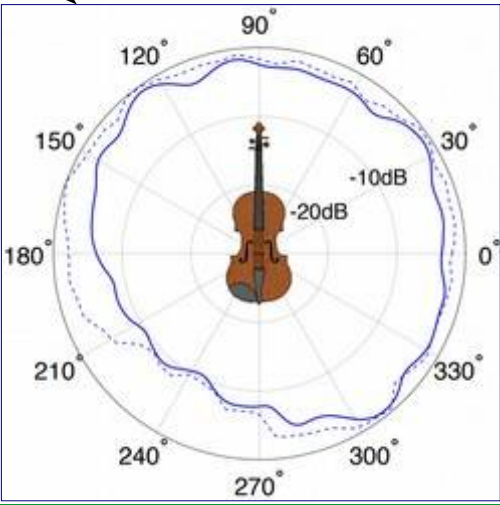
Produzione del suono



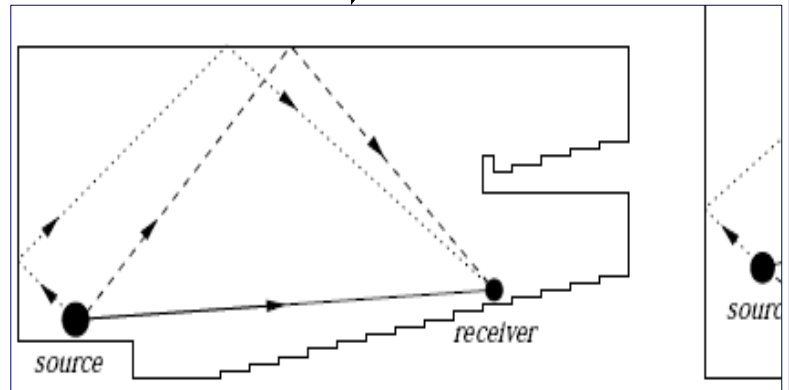
Vibrazioni e risonanze

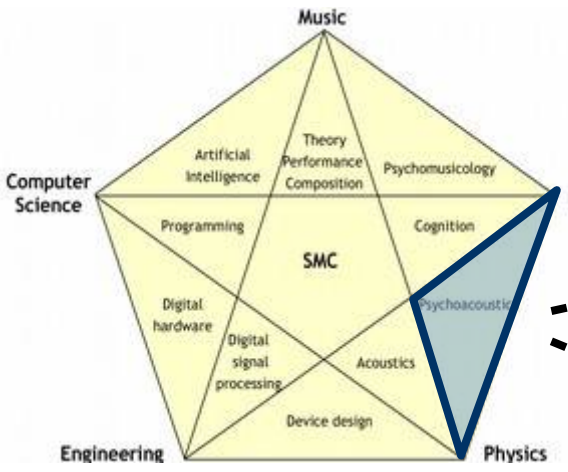


Radiazione

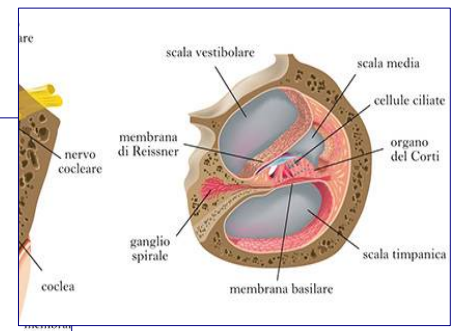
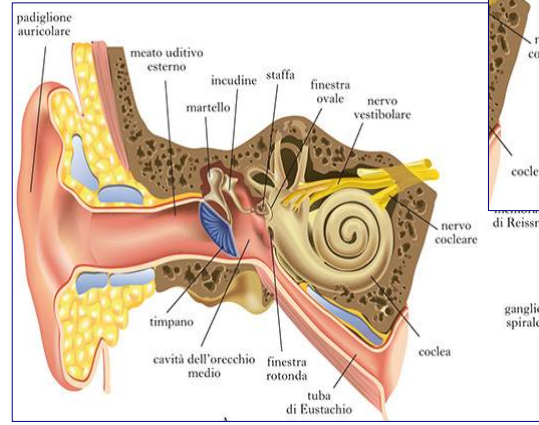


Trasmissione del suono e ambienti





Fisiologia dell'orecchio



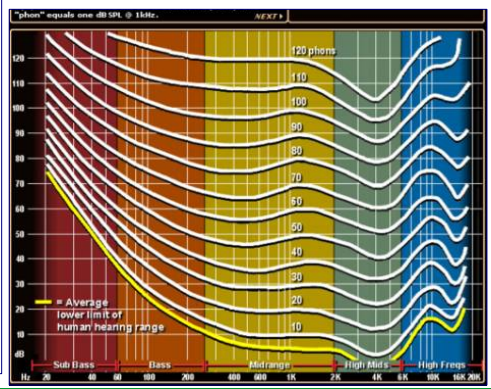
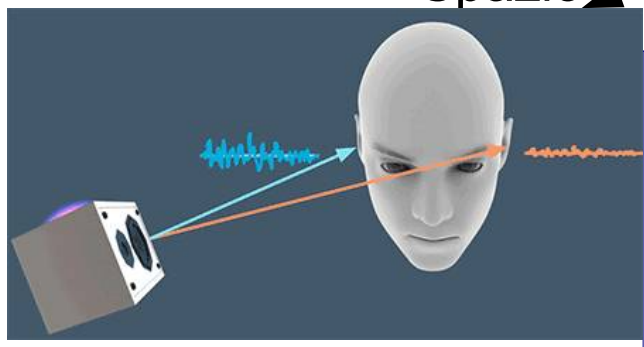
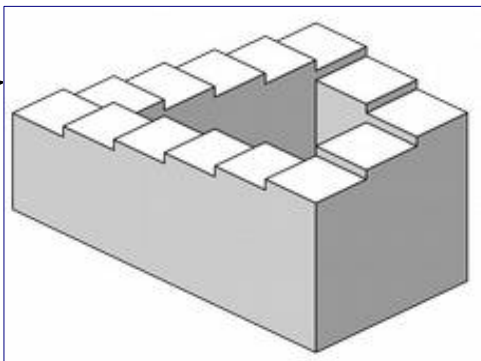
Percezione di attributi del suono

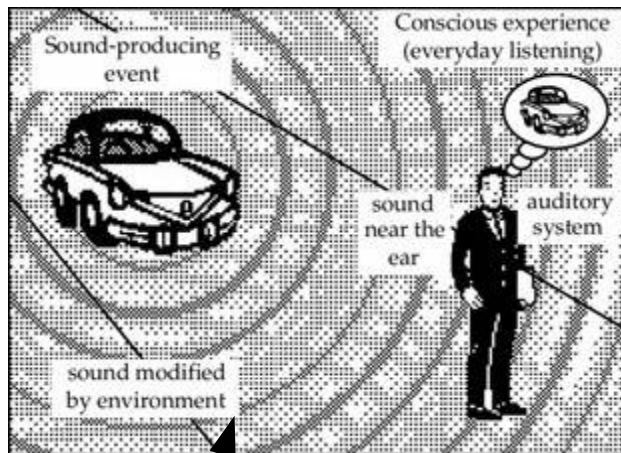
Spazio

Timbro

Altezza

Intensità

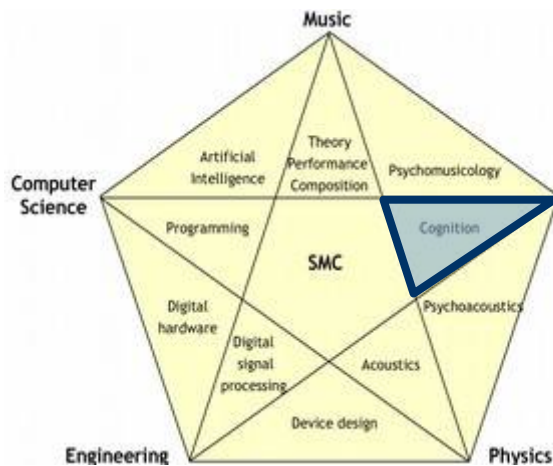




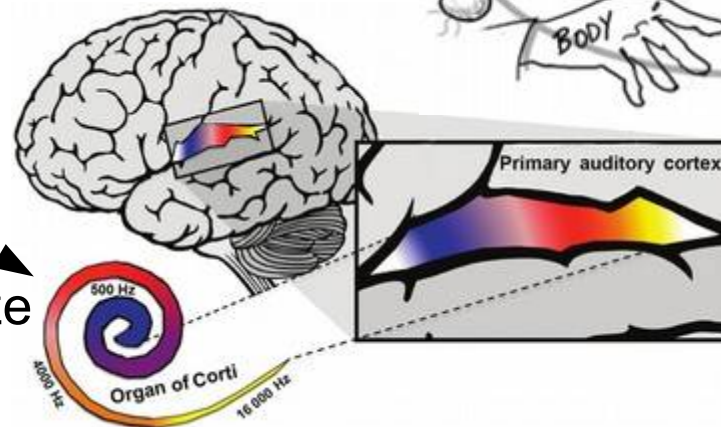
Acustica
ecologica

Analisi della scena uditiva

Cognizione "embodied"



Neuroscienze
uditive

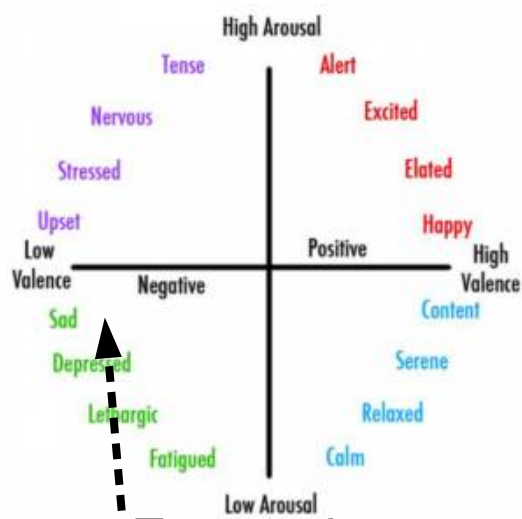
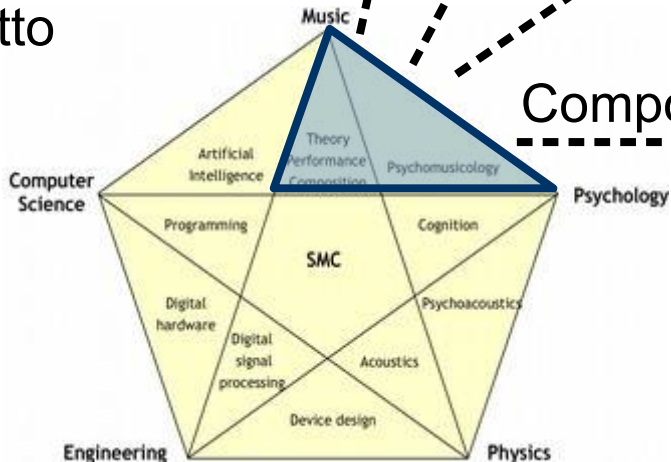




Nuovi
strumenti

Performance

Storia
Economia
Diritto
...



Espressione
ed emozioni

Goldberg Variations

BWV 988
(PART I)

J.S. Bach (1685-1750)



Teoria,
armonia,
notazione, ...

Musica
concreta



Composizione

Musica
formalizzata

MORSIMA AMORSIMA
MORSIMA - AMORSIMA
Dedicato a Mamas HADZIDAKIS
Χαρίζονται στον Μάνο Χατζιδάκι
(ST/4-1, 03.07.62)

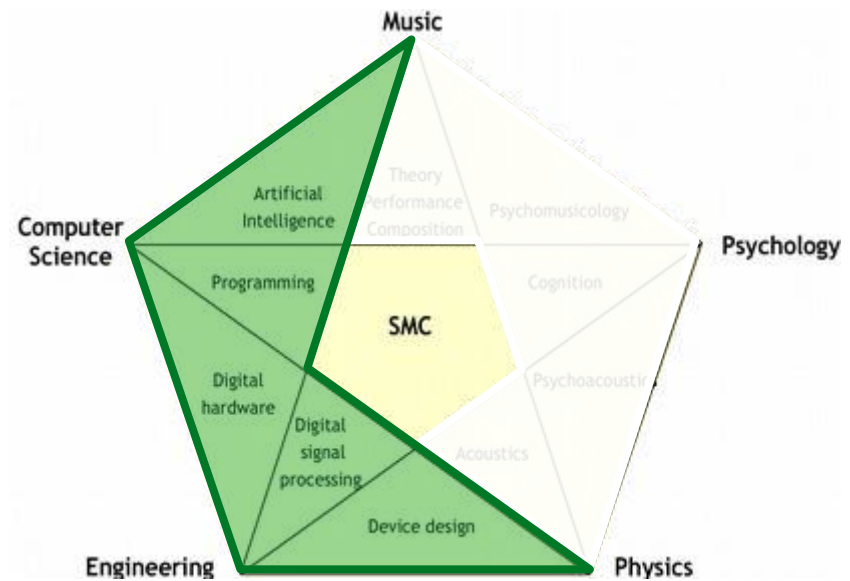
asp. raso sul pent.
an. arco pml. raso.
sol. fugghe sul legno pas de vibrato

Jannis Xenakis

40 mm = ♩ = 80 mm

smC

... Computing





UNIVERSITÀ DEGLI STUDI DI MILANO

Plugin audio studenti IM

lim.di.unimi.it/demo_vst_ita.php



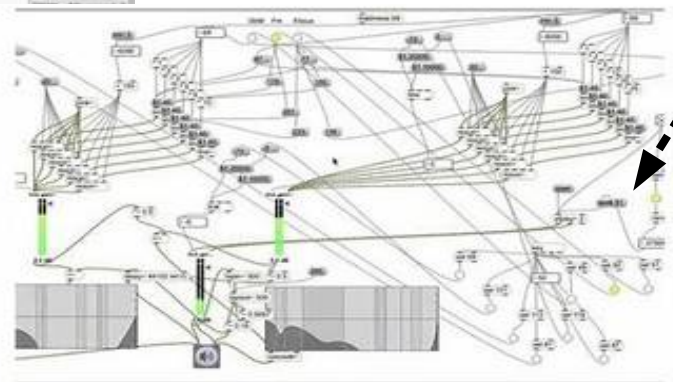
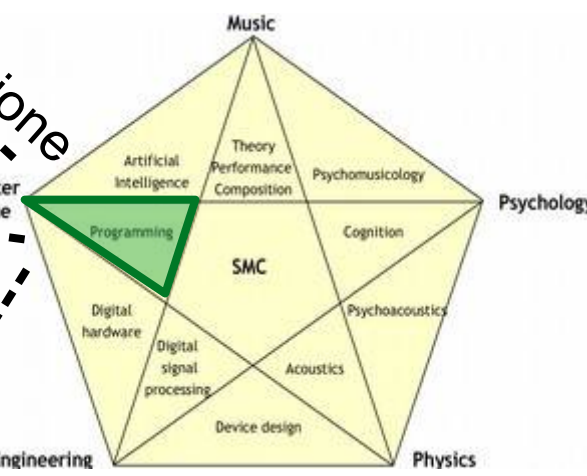
Plugin audio

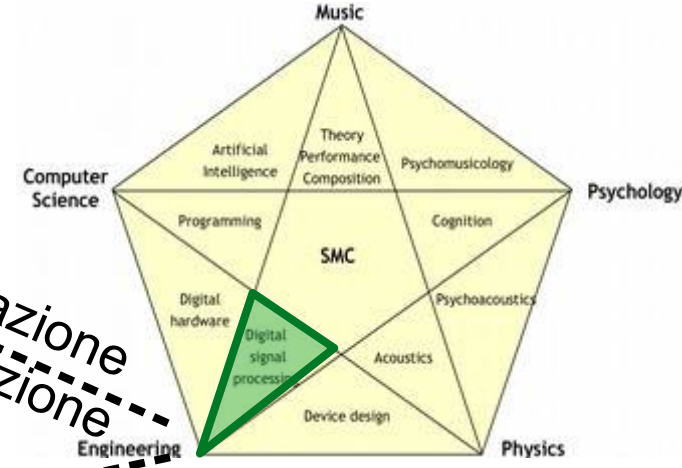
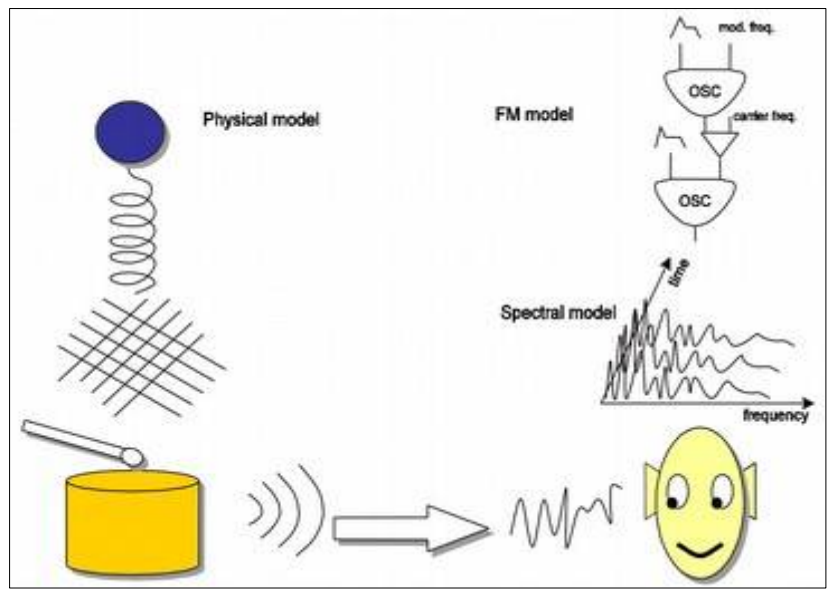
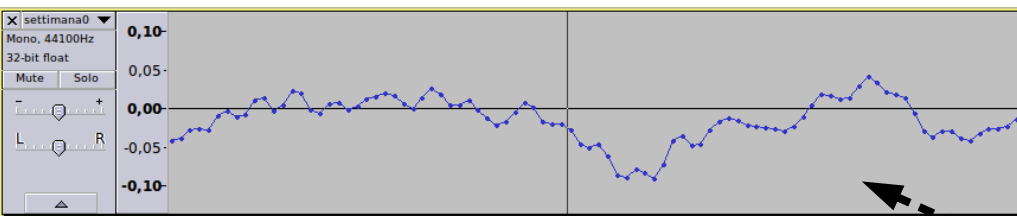
Digital Audio Workstation (DAW)

Produzione

Notazione

Composizione



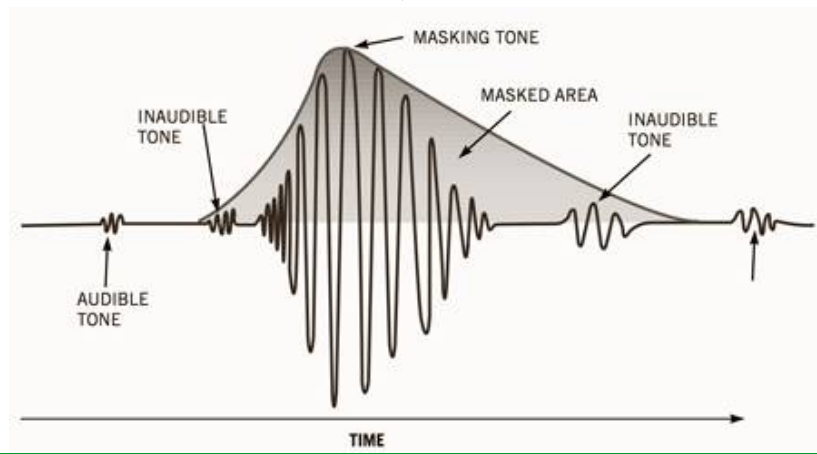


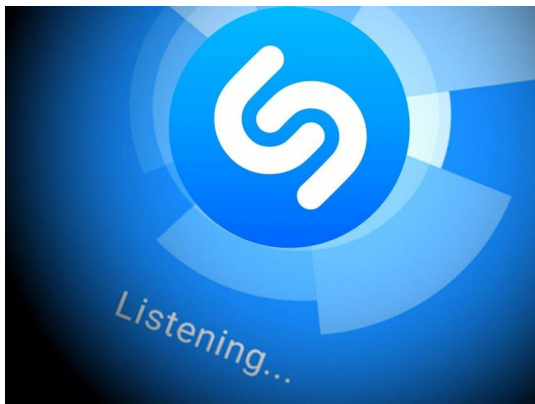
Digitalizzazione ed elaborazione

Sintesi ed effetti

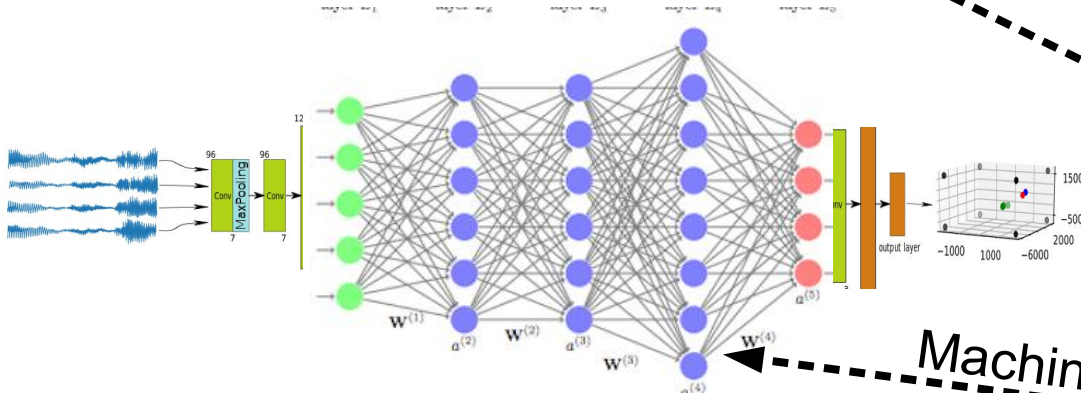
Audio 3D

Modelli uditivi e codifica percettiva





Brani



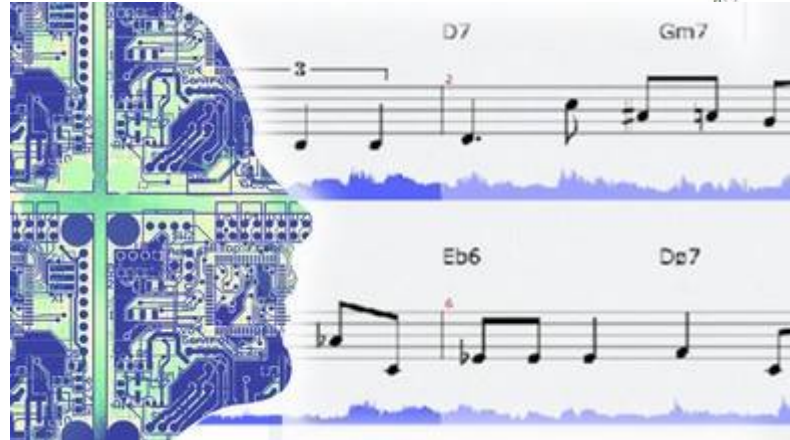
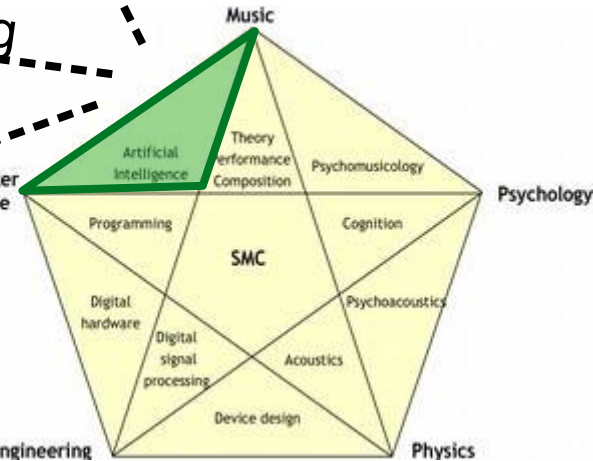
Accordi

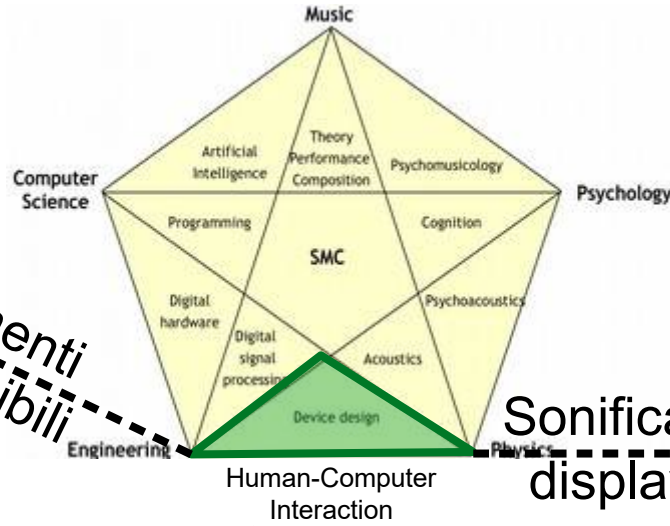
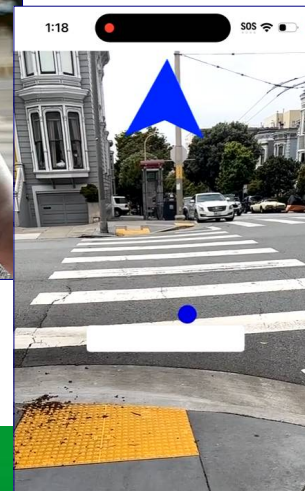
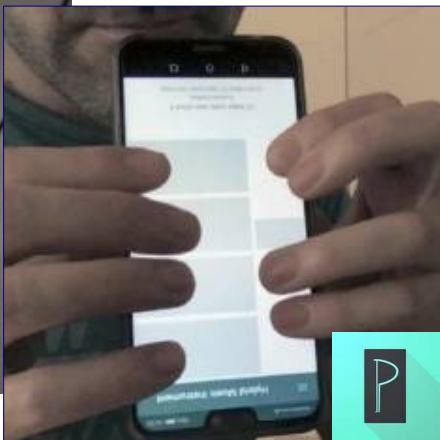
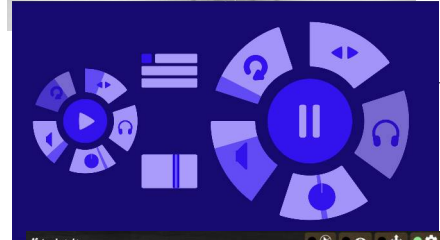
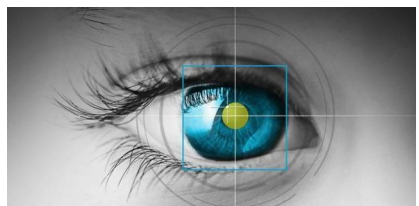
Ecc.

Music
Information
retrieval

Machine hearing

Generazione artificiale
di suono e musica



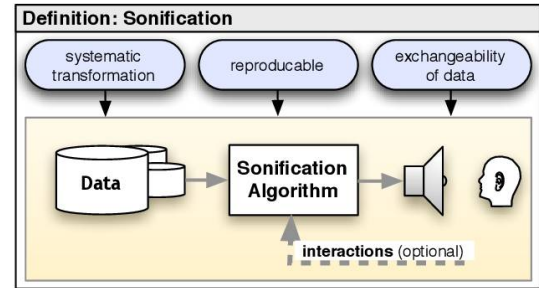


Strumenti accessibili

Strumenti digitali e aumentati

Sonificazione e display uditivo

Tecnologie assistive

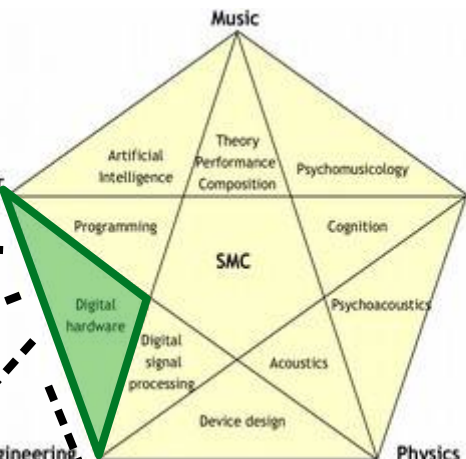




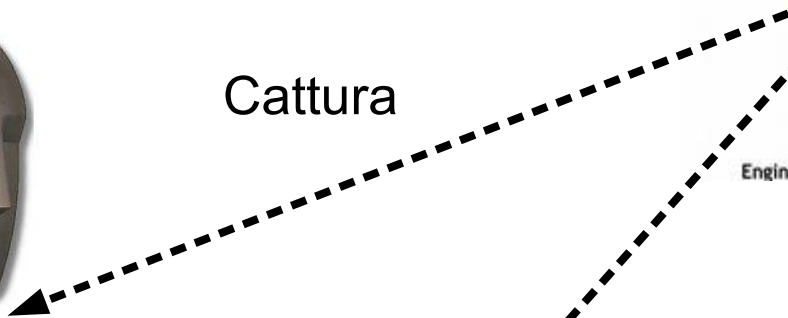
Riproduzione



Computer Science



Cattura

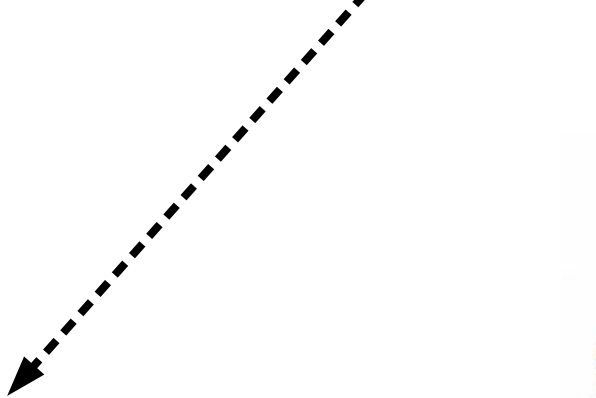


Engineering



Sensori e attuatori

Conversione





Lingua inglese livello B1 (I.1)

Matematica del continuo (I.1)

Programmazione (I.1)

Semiotica della musica (I.1)

Acustica (I.2)

Architettura degli elaboratori (I.2)

Elementi di economia dei beni musicali (I.2)

Modelli della percezione musicale (I.2)

Algoritmi e strutture dati (II.1)

Basi di dati (II.1)

Elaborazione dei segnali (II.1)

Informatica applicata al suono (II.1)

Sistemi operativi (II.1)

Informatica applicata alla musica (II.2)

Statistica e analisi dei dati (II.2)

Elementi di diritto dell'informazione musicale (III.1)

Metodologie e tecnologie per l'editoria musicale (III.1)

Programmazione per il web (III.1)

Reti di calcolatori (III.1)

A scelta guidata (III)

A scelta libera (III)

Tirocinio e prova finale



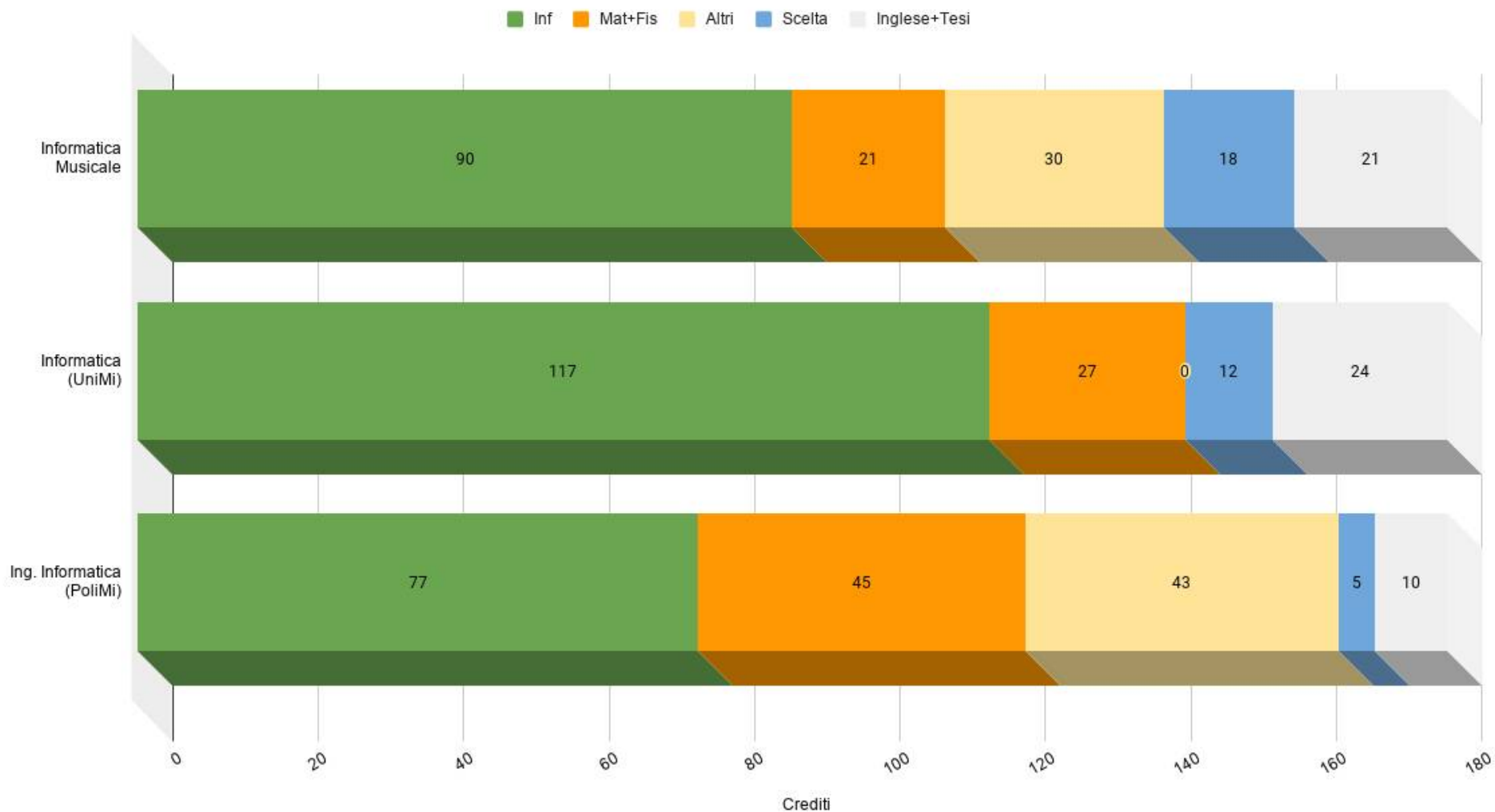
informaticamusicale.cdL.unimi.it

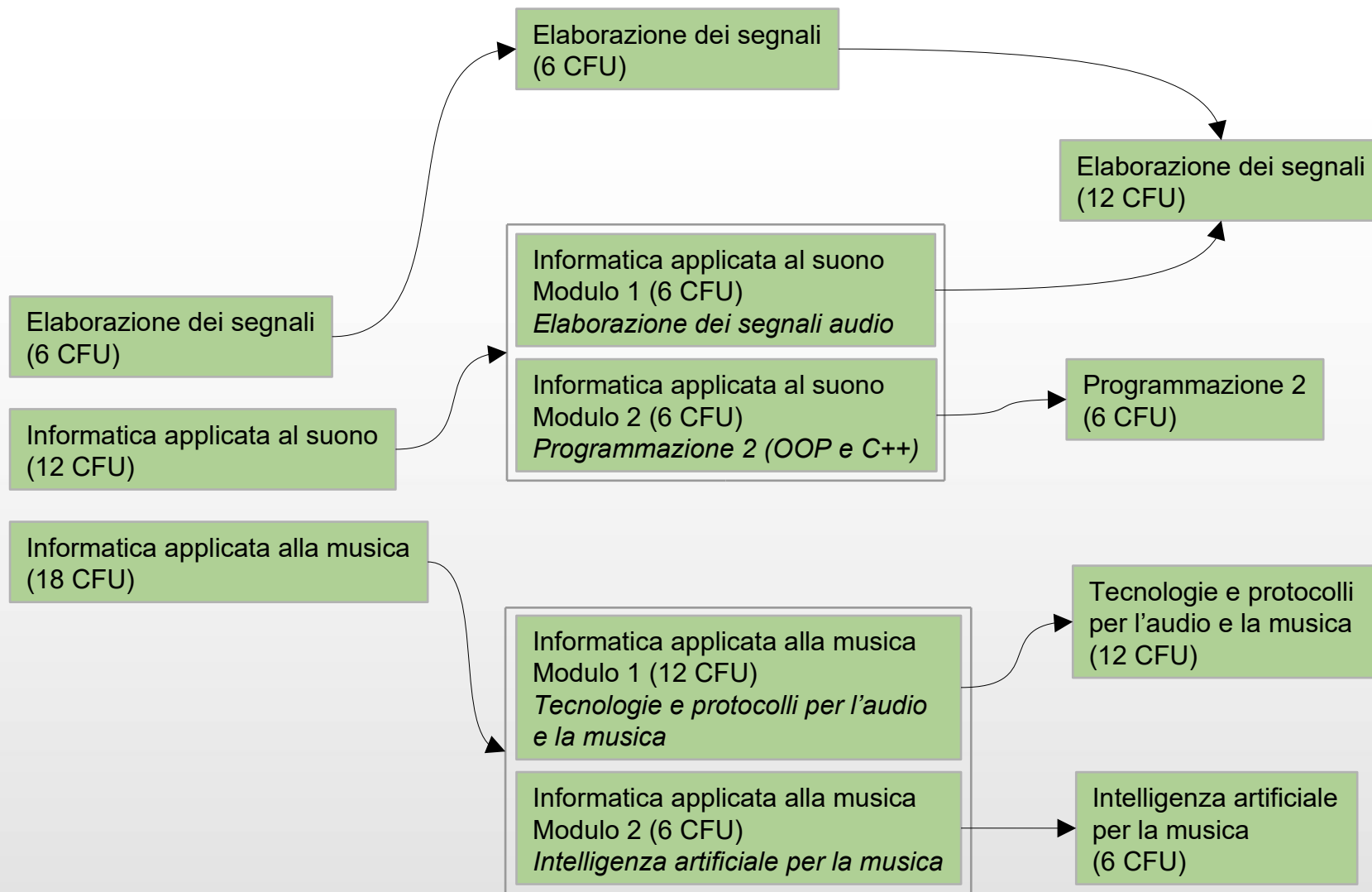


Presentazione CdL (20-21)

<https://youtu.be/mfhtQ0rvos0>

Confronto con altri CdL





- “Ma io voglio programmare plugin VST... a che servono Mate e Elaborazione?”

Programmazione di plugin VST:

Ideal fractional-delay filter

- It's an allpass with linear phase response

- $H_{id}(\omega) = e^{-jD\omega}$

- Then impulse response is a sampled sinc:

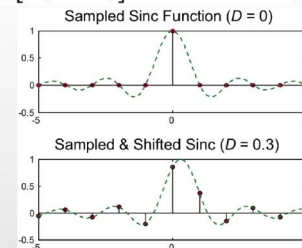
$$h_{id}(n) = \frac{1}{2\pi} \int_{-\pi}^{\pi} e^{-jD\omega} e^{j\omega n} d\omega = \frac{\sin[\pi(n-D)]}{[\pi(n-D)]} = \text{sinc}(n-D)$$

- D integer

- Sampled at zero-crossings: impulse!

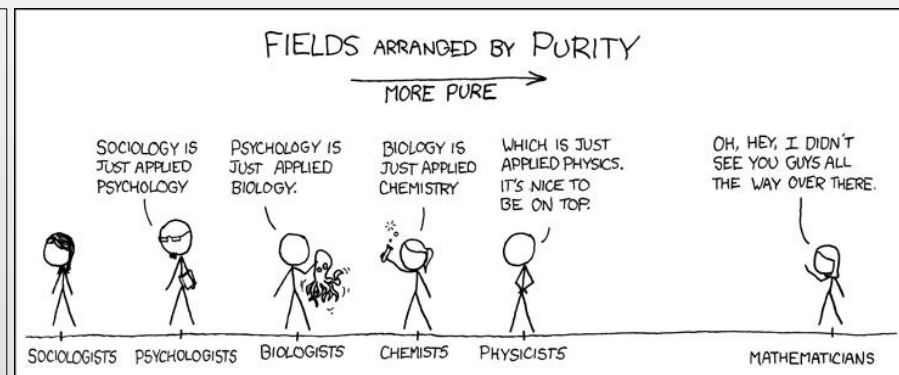
- D fractional

- Sampled between zero-crossings: IIR, non causal response



La filosofia è scritta in questo grandissimo libro che continuamente ci sta aperto innanzi a gli occhi (io dico l'universo), ma non si può intendere se prima non s'impara a intender la lingua, e conoscer i caratteri, ne' quali è scritto. Egli è scritto in lingua matematica, e i caratteri son triangoli, cerchi, ed altre figure geometriche, senza i quali mezzi è impossibile a intenderne umanamente parola; senza questi è un aggirarsi vanamente per un oscuro labirinto.

Galileo Galilei, *Il Saggiatore*



Attività complementari



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Steinberg e UniMi: una
sinergia per la didattica
delle nuove tecnologie
musicali



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SCIENTIFICA E DIDATTICA





Laurea e oltre



www.lim.di.unimi.it/people_former_students_ita.php



- Corso di Laurea Magistrale in Informatica
 - Percorso in Informatica Musicale
- Dottorato in Informatica
 - Progetti di ricerca in Informatica Musicale

www.almalaurea.it/universita/indagini/laureati/occupazione



- Sito del CdL
 - <https://informaticamusicale.cdl.unimi.it>
 - Orari, programmi, piani di studio, tesi, messaggi
- Siti degli insegnamenti
 - <https://ariel.unimi.it/>
 - Libri di testo, slide, videolezioni, comunicazioni, ...
- Tutor di processo:
 - <https://orientamento.di.unimi.it/index.php/contacti/tutor-di-processo>
 - Supporto a matricole
- Network studenti
 - <https://studentiunimi.it/>
 - Gruppi insegnamenti/CdL, servizi vari



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