Computational Linguistics for reasonable accommodation and inclusive academic contexts

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The POLIMI Inclusive Model

- The MultiChancePoliTeam (MCPT) is the group of specialists that provides personalized services to students with Disabilities and Specific Learning Difficulties (SpLD).

- The Politecnico model aims to encourage professionalism, individual autonomy, innovation, creativity, and social inclusion – with no special treatment in the assessment of the skills that are actually acquired – and supports the intermediation phase with labor market
Becoming protagonist of innovative ICT research

- In 2016: 38000 students at Polimi:
  - 28000 engineering
  - 7000 architecture
  - 3000 design

- Students with Disability and SpLDs:
- From 2003 to June 2016 (from 96 to 476)
  - Motoric: from 44 to 39
  - Visual: from 4 to 14
  - Hearing: from 15 to 11
  - Psychiatric: from 1 to 20
  - Organic: from 30 to 94
  - SpLD: from 2 to 298

- Gender and Faculty
  - 57% Engineering, 43% Architecture or Design
  - 74% Male, 26% Female
Employment data for students with disability

- From 2003: 0% unemployment rate for Engineers

  - Direct Employment: 58%
  - Stage, then Employment: 28%
  - Stage: 14%

- By disability:
  - Hearing: 14%
  - Motoric: 36%
  - Organic: 37%
  - Visual: 10%
  - Psychic: 3%
Employment data for students with disability

- From 2003: Engineering, Architecture and Design - Company Sectors:
  - 31% ICT
  - 19% Public Sectors
  - 12% Architectural, Real Estate, Building
  - 12% Electronic, Electric, Energetic
  - 4% Aeronautical
  - 6% Finance, Insurance, Banking
  - 1% Environmental
  - 5% Mechanics
  - 9% Other (chemistry, pharmacy, transportation)
  - 2% Fashion
Becoming protagonist of innovative ICT research

• **Students with SpLD and Disability** are asked to actively cooperate with ICT researchers to design innovative solutions for their daily academic, social and cultural life.

• **SpLD and Hearing Difficulties have been addressed as critical:** solutions based on Computational Linguistics have been chosen for research cooperation.
## SpLDs: Diagnosis /Architecture & Design (2014/2015)

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SpLDs: Diagnosis /Engineering (2014/2015)
The ICF* Model

- Students are invited to describe themselves using the ICF* Model (a customized version of the WHO ICF Model)
- ICF* provides a simpler yet expressive model for the description of university students and for the personalization of software applications
- ICF* has been used also to profile companies to support employment

We:
- Discarded some Constructs (s, body structures)
- Condensed some Domains
- Substituted some Domains with more specific ones (i.e. upper and lower limbs stability)
- Added a new Construct named ‘t ITF Skills’
  - t1 Act on the System Interface
  - t2 Understand the System Interface
Applications supporting academic life

THE CATS Project supported by MIUR

PoliSpell developed an advanced spell checker, specific for users with SpLD. The spell checker exploits the context in order to capture “out of context” words (e.g., “pile” vs. “pine”), and provides a predictor, suggesting the next most probable word to insert, given the last words written by the user and the previous user’s behavior.
**Applications supporting academic life**

**SPARTA2** is a tool supporting the authoring of highly accessible Italian texts. It provides two kind of information: numeric estimations of the complexity of texts, and warnings/advices about phrase structures that appear to be the problematic parts of the text. It suggests where the critical parts are, and how to modify them.

The **Readability Index** is composed of three sub-indexes: the *Gulpease Index*, the *Chunk Index*, and the *Chunk Type Index*.

The **Understandability Index** measures the complexity related to the lexicon. And to the structure of the sentences.
Applications supporting academic life

PoliNotes

- Slides shown by the teacher are subdivided in *objects*
- And sent *in real time* to the student’s Tablet-PC
- The contents can be *rearranged* on the electronic sheet
- The student can also add *notes and drawings* using a stylus

PoliLips - In a single integrated solution we mix the three information modalities we can collect from the teacher:

- visual (lips-reading),
- aural (amplified signals),
- and textual (generated by an ASR application)
Applications supporting academic life

- **PoliBook**: an electronic text book that emulates a paper book and permits students to add notes and new pages

- **BiText**: a Multilingual eBooks reader. Exploits eBook natural dynamicity. Show translation, on demand

- Other supports for **Accessible Distance Learning**
 Applications supporting academic life

KEaKI (Knowledge Extraction and Knowledge Inference)

• Document Analysis: to summarize and to infer knowledge
• Domain description based on ontology (a knowledge base)
• Mental map generation for SpLD
• Facilitation of text comprehension
KaSPAR (Karaoke Speech-Prosody Analyzer and Recognizer) is a prosodic multimodal software, currently under construction, supporting students with Auditory Disability and SpLD on learning English as a foreign language.

The project uses knowledge coming from different fields of study, first of all, creating a link between learning English prosodic problems in SpLD and the extraction of acoustic features, already known in the Music Information Retrieval field and MPEG-7 encoding.
• The ICT4IAL Project: from development to implementation of Guideline (available at www.ict4ial.eu)

• The ICT4IAL network: European Agency, European Schoolnet, DAISY Consortium, G3ict, International Association of Universities, and UNESCO

• To encourage and support different educational contexts and relied organizations to adopt more inclusive strategies
INFORMATION ACCESSIBILITY FOR LEARNING - GUIDELINES

• **How to produce:** accessible texts, pictures, audio, video, on-line electronic documents, on-line resources, slides and presentations, teaching and learning materials on specific formats (as pdf, ePub), ...

• **The importance of** local, national and international policies that involve different stakeholders

• **Open and un-sufficient points:** Open Access, accessible materials and contents production, copyrights and digital version of books, different policies for Italian Libraries, training of specialists on Accessibility
Bibliographic References:


Licia Sbattella, PhD – Bioengineer, Clinical Psychologist and Psychotherapist is Associate Professor of Natural Language Processing and Accessibility and Rector’s Delegate for Disability at Politecnico di Milano. Since 2007 she is member of the Program Committee of the UN G3ict (Global Initiative for Inclusive ICTs). Since 1983 she is founder and scientific director of Esagramma - a clinic and research center in Milano - and since then she conducts the Esagramma Symphonic Orchestra: the first symphonic group in Europe that gives concerts and involves professional musicians and persons with intellectual disabilities and autism.