Polytechnic School of Pernambuco
Master in Computing Engineering

Languages of Americas Workshop
May 24-25, 2018

Prof. Alexandre Maciel
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University of Pernambuco - UPE

- Public state university

- Since 1991
  - Isolated schools before

- 12 campuses in Pernambuco

- Numbers:
  - 25,509 students
  - 1,283 professors
  - 5,149 employees

- Undergraduate programs:
  - 12 master’s degree
  - 6 doctorate degree
Polytechnic School of Pernambuco - POLI

- Founded in 1912
  - Oldest unity of UPE

- Courses:
  - 7 under-graduations
  - 19 specializations
  - 4 master’s degree
    - Computer Engineering
    - Systems Engineering
    - Civil Engineering
    - Energy Technology

- Numbers:
  - 3,400 students
  - 150 professors
  - 409 employees
• Pionner in UPE and Brazil
• 17 professors (6 CNPQ Productivity Researchers)
• Research lines:
  – Computational Intelligence and Software Engineering
• Numbers:
  – 120 M.Sc. Thesis approved
  – 58 M.Sc. Students currently enrolled
Main topics researched:

- Novel metaheuristics for solving real world problems
- Social Simulation & Stochastic Modeling
- Pattern recognition & Machine Learning
- Frameworks, Domain Specific Languages & Tools
- Requirements and Software Engineering
• Research lines:
  – Pattern Recognition (image and audio)
  – Data mining (educational, marketing)
  – Forecasting (energy, finances, ...)

• Numbers:
  – 10 Researchers
  – 18 Ms. Students

• Partnership with industry
Prof. Alexandre Maciel

• Education
  – Ph.D. Computer Science, UFPE (2012)
  – M.S. Computer Science, UFPE (2007)

• Positions
  – Adjunct Professor of Computing Engineering Course – POLI
  – Member of Master Program in Computing Engineering – POLI
  – Coordinator of Specialization on Data Science and Analytics – POLI
  – Visitor Researcher on State Agency of Information Technology – ATI
  – Member of Innovation Chamber – FACEPE
  – General Coordinator of Innovation – UPE
Prof. Alexandre Maciel

• Research interests:
  – Pattern Recognition
  – Data mining
  – Informatic in Education

• Main award:
  – Science and Innovation Santander 2014

• Research grants and funding:
  – CNPQ Technological researcher
  – More than one million Reais in research projects
Project FIVE

• **Framework for an Integrated Voice Environment**

• Engines production:
  - Speech recognition
  - Text-to-Speech
  - Speaker verification

• Extensible and portable:
  - Mobile, Digital TV, IVR

• Software registration on INPI
Language Resources

• **Isolated Words:**
  – 40 speakers (30 male, 10 female)
  – Age (23.5 years old)
  – Location: Brazil northeast
  – Controled noise
  – 20 words:

• **Features:**
  • 8kHz
  • 16 bits
  • mono

Examples:

<table>
<thead>
<tr>
<th>abrir</th>
<th>anterior</th>
<th>descer</th>
<th>desligar</th>
<th>devagar</th>
</tr>
</thead>
<tbody>
<tr>
<td>direita</td>
<td>entrar</td>
<td>esquerda</td>
<td>fechar</td>
<td>ligar</td>
</tr>
<tr>
<td>não</td>
<td>parar</td>
<td>próximo</td>
<td>rápido</td>
<td>sair</td>
</tr>
<tr>
<td>seguir</td>
<td>seleccionar</td>
<td>sim</td>
<td>subir</td>
<td>voltar</td>
</tr>
</tbody>
</table>
Language Resources

• **Avatar Educação (Cid and Lis):**
  – 2 professional speakers (1 male, 1 female)
  – *Speech therapy treatment to avoid regionalism*
  – *Studio environment*
  – 800 balanced phonetic phrases:

  – **Features:**
    • 44kHz
    • 16 bits
    • stereo

Examples:

<table>
<thead>
<tr>
<th>Paradoxalmente, por que não se exige a presença dessa disciplina nos exames do vestibular?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Por que Brasil e Portugal tem esse estranhamento e essa identificação tão forte?</td>
</tr>
<tr>
<td>O vizinho Pires de Melo mandou saber se eu queria barganhar a pele da onça.</td>
</tr>
</tbody>
</table>
Quality evaluation:

- Mbrola, FIVE and Loquendo
- 30 phonetic balanced utterances
- 30 volunteers
- Listen and transcribe
Development and Integration of Natural Brazilian Portuguese Synthetic Voices to Framework FIVE

Danilo S. Barbosa, Byron L. D. Bezerra, and Alexandre M. A. Maciel

• **New Phonetic Database**
  – 140 thousand words in PT-BR
  – SAMPA phonetic alphabet
  – New G2P algorithm [Neto]

• **Quality Evaluation**
  – HTK, Mary TTS (U and H), Natural
  – 40 phonetic balanced utterances
  – 100 volunteers
  – Naturalness and Intellibility

Examples:

Fig. 4. Results of the naturalness
Fig. 5. Results of the intelligibility
Project Avatar Education

• Animation + Speech Synthesis + Data Mining

• Messages and notifications

• Moodle, PowerPoint, Android

• Software registration on INPI
Integração do Mecanismo de Síntese de Fala
MaryTTS ao Avatar Educação

Fabio Alexandre de Holanda    Danilo de Souza Barbosa    Alexandre Magno Andrade Maciel

• Adjusts on Middleware Avatar Vocálico and Framework FIVE to recognize three types of Engines:
  – HTS Voice
  – Mary TTS
    • HM Voice
    • UCS Voice
Language Resources

• **SARA – F123 (private database)**
  – 1 professional speakers female
  – 6815 balanced phonetic phrases
    • Avatar Educação, Laos [Neto] and CETEMPublico
  – 10 hours and 28 minutes

  – **Features:**
    • Wav, MP3 and Flac
    • 16kHz and 44kHz
    • 32 bits
    • mono

Examples:
An Approach for Thematic Relevance Analysis Applied to Textual Contributions in Discussion Forums

The TRC indicates the degree of relevance of a post according to the topic of the forum…

… equivalences between the nodes and the edges of the formed networks
An Approach for Thematic Relevance Analysis Applied to Textual Contributions in Discussion Forums
A general solution in emotion recognition with speech using semi-supervised learning

Ingryd Pereira and Alexandre Maciel

• **Datasets:**
  - SAVEE
    • 4 male actors in 7 different emotions
    • 480 British English utterances in phone level
  - OMG Emotion
    • 420 Youtube videos in American English (10 hours)
    • 11635 unique annotations for 7 different emotions + arousal and valence
  - IEMOCAP
    • 12 hours of audiovisual data, including video, speech, motion capture of face, text transcriptions.
    • 8 different emotions + valence, activation and dominance
A general solution in emotion recognition with speech using semi-supervised learning

Ingryd Pereira¹ and Alexandre Maciel¹

• Superior or equivalent results compared to state of the art;

• Future works:
  – Building a Portuguese emotional dataset
  – Tests with datasets of others languages
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