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Track Record and Capabilities of the Biomedical Engineering Group at the University of Valladolid in Respiratory Disease Research

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Jornadas de Personal Investigador Joven CIBERES – CIBERBBN, El Escorial, 6 – 7 de noviembre, 2025

Who We Are

Biomedical Engineering Group (*Grupo de Ingeniería Biomédica*, GIB) at the University of Valladolid (UVA)

Member of CIBER-BBN (CB19/01/00012 group) since 2019

Composed of engineers and physicians of different fields

>20 years of research experience in the field of respiratory diseases

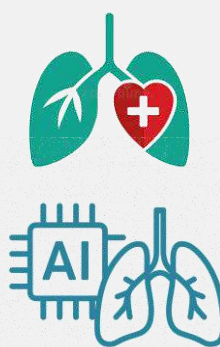


Our Research Focus

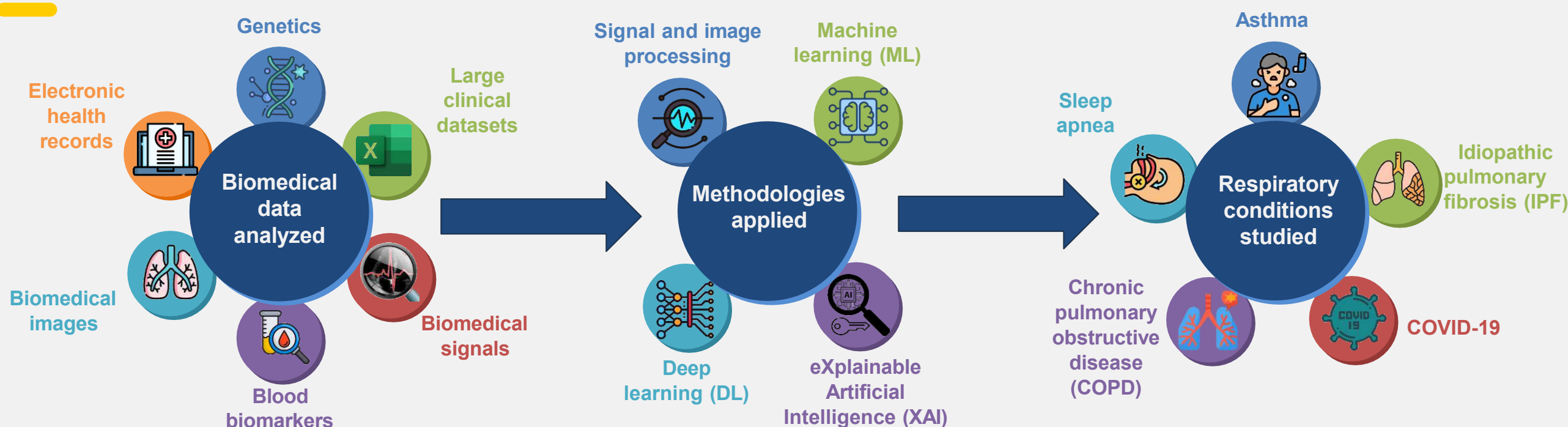
We work closely with national and international physicians specializing in areas such as pneumology, emergencies, and pediatrics

We develop engineering solutions to improve the diagnosis and management of respiratory diseases

Analysis of biomedical data: advanced processing techniques and artificial intelligence (AI) methods



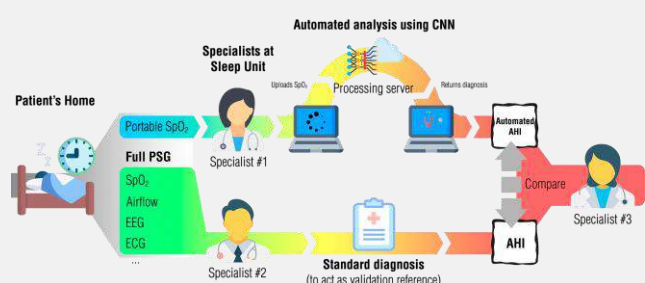
Expertise and Capabilities



Key Results in Respiratory Disease Research

Automated diagnosis of sleep apnea using cardiorespiratory signals

Signal processing, ML, and DL approaches: 90% accuracy in adults ~80% accuracy in children Proof-of-concept in a clinical setting



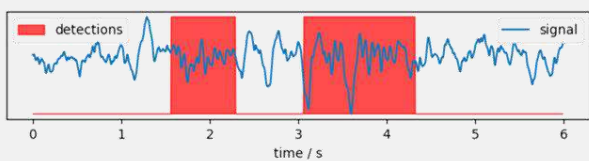
Sleep stage detection using pulse oximetry signals

DL: >80% accuracy XAI: stage-related pulse oximetry patterns



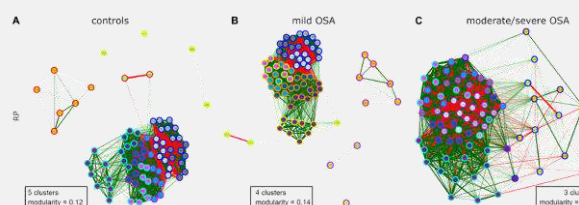
Sleep stage and spindle detection using EEG signals

Signal processing + ML/DL: >85% accuracy for sleep staging and >0.7 F1-score for sleep spindle detection



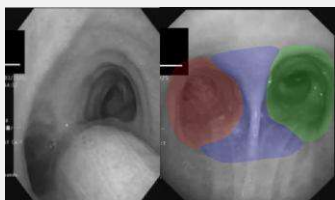
Pediatric Sleep Apnea: The Overnight EEG as a Phenotypic Biomarker

Signal processing + correlation networks → sleep EEG is able to assess cognitive changes in pediatric sleep apnea.



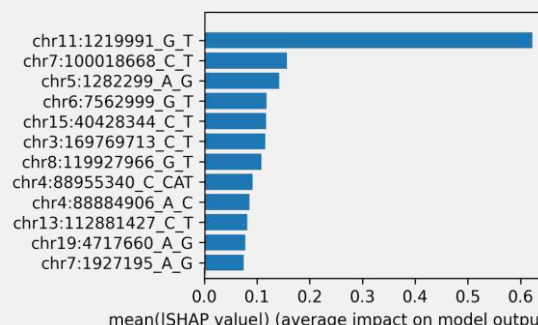
Automatic detection of airway structures in bronchoscopy images using DL techniques

Segmentation: IoU of 0.674 Localization task: average accuracy of 91%



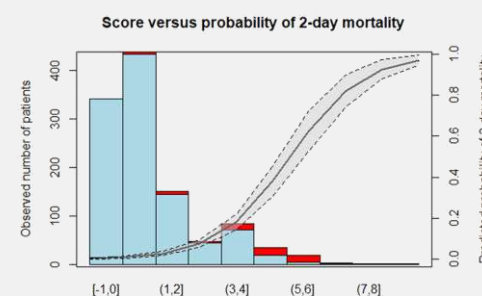
AI analysis to predict IPF and to prioritize genetic variants

ML: ~0.8 AUC for IPF prediction XAI → Prioritization of previously IPF-related variants MUC5B



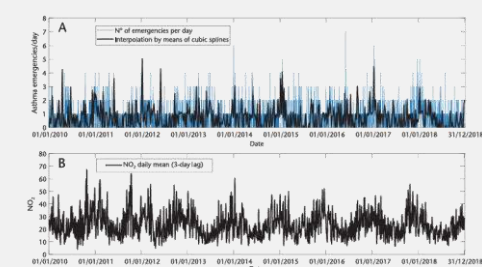
A blood biomarker score for 2-day mortality prediction from prehospital care

Novel blood biomarker score, composed of creatinine, lactate and pCO2: AUC of 0.933



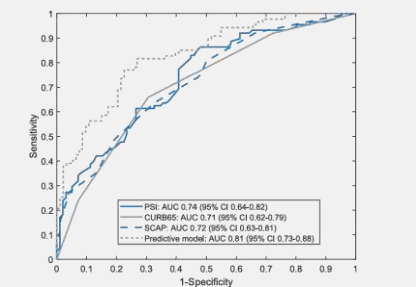
Impact of atmospheric nitrogen dioxide on emergency department (ED) visits for asthma in a low air pollution area

Positive association (relative risk, 1.056, P < .05) between atmospheric NO2 concentration and greater risk of visiting an ED within 3 days



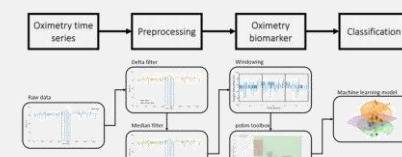
Risk models for predicting in-hospital mortality from COVID-19 pneumonia in the elderly

Predictive ML model for mortality from demographic, clinical, and analytical variables: 0.81 AUC



Machine learning for nocturnal diagnosis of COPD using digital oximetry biomarkers

Signal processing + ML: AUC=0.93 ± 0.02 XAI: set of digital oximetry biomarkers for COPD



Scientific Track Record

>80 Journal Citation Report (JCR) articles: collaborations with CIBERES (CB22/06/00035) and CIBER-BBN (CB06/01/0062) groups

>20 R&D regional, national, and European projects (>10 in the last five years)

1 national and 2 USA patents

Remarkable international collaborations: David Gozal, Thomas Penzel, Timo Leppanen, etc.



Let's Collaborate

Our experience and capabilities could be of great value in establishing collaborations with CIBER groups in respiratory disease research

Looking for → collaborations with research groups interested in
▪ Analysis of large-scale and heterogeneous biomedical data
▪ Application of AI-based methodologies

Open to participating in research project calls

Contact information: <https://es.linkedin.com/company/gib-uva>, <https://gib.uva.es/>

