Human-centered Information Processing

Seek a window into human mind and traits…

…through engineering approach

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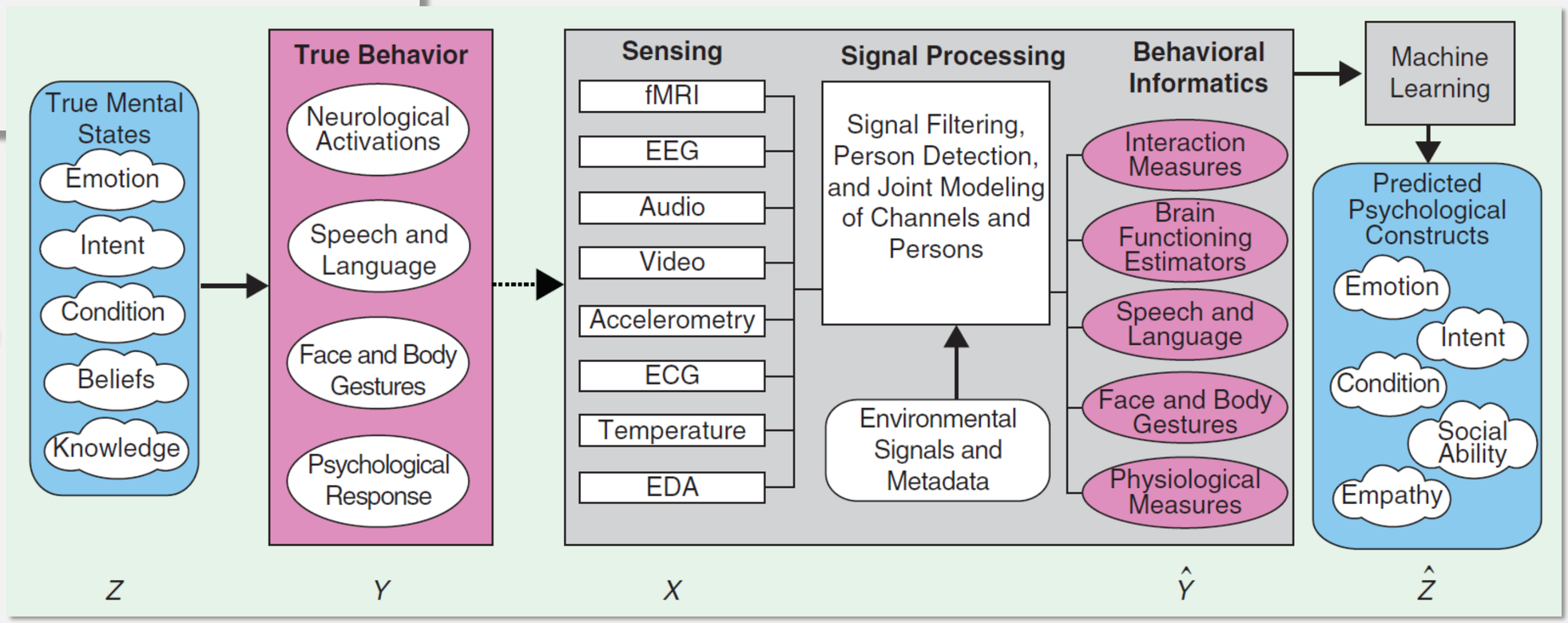
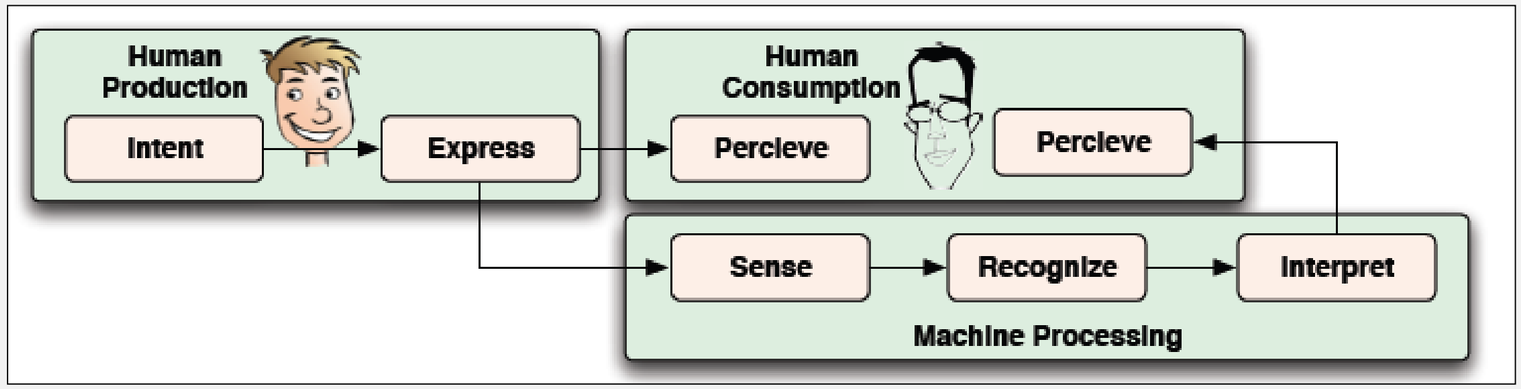
Global Research Network

SAIL LAB @ USC, USA
SCUBA LAB @ USC, USA
MSP LAB @ UT Dallas, USA
CHAI LAB @ Univ. Michigan, USA
HUBBS LAB @ Texas A&M, USA
INSPIRE LAB @ SUNY, USA
SPIRE LAB @ IISC, India
TANAYA LAB @ Univ. Warwick, UK
MING LAB @ Duke Kunshan, China
BIIC LAB @ NTHU, Taiwan
…



S. Narayanan and P. G. Georgiou, "Behavioral signal processing: Deriving human behavioral informatics from speech and language," Proceedings of the IEEE, vol. 101, no. 5, pp. 1203–1233, 2013.
Daniel Bone, **Chi-Chun Lee**, Theodora Chaspari, James Gibson, Shrikanth Narayanan, "Signal Processing and Machine Learning for Mental Health Research and Clinical Applications", in IEEE Signal Processing Magazine



Employ and advance signal processing and machine learning to <u>sense</u> and <u>interpret</u> human behaviors through meaningful <u>interdisciplinary</u> research

- Aid in, and transform the conventional methods employed across *<u>almost all</u>* effort in understanding humans
- Exemplary domains on : psychology, health, education, so on…

Many benefits:

<u>speedup</u>, <u>just-in-time observation</u>, <u>large scale hidden trends</u>, <u>objective</u>

- State of the art hasn't changed for three decades

Many exciting challenges:

Data Instrumentation, Experimental Protocol

Signal Processing/Machine Learning

- Uncertainty in observations (partial, noisy)
- Subjectivity in descriptions (higher level behavior)
- Heterogeneity and variability in how data are generated and used

<u>Human-centered Analytics</u>: Next-generation decision-making tool for domain experts

訊號處理、機器學習
Enabling Technologies

領域專家知識
Domain Experts Knowledge

Low level descriptors

Acoustic features

Image features

Motion features

Text features

Speech recognition

Dialog act tagging

Keyword spotting

Face recognition

Action recognition

Text processing

Sentiment Analysis

Affect recognition

Speaker states and traits

Visual-speech processing

Interaction modeling

Social behavior

Affective behavior

Communicative behavior

Dyadic behavior

Evidence-based observational coding

Coder variability control

Development of coding manual

Self report measure validity

Coding mechanism

Subjective assessment

Intervention efficacy

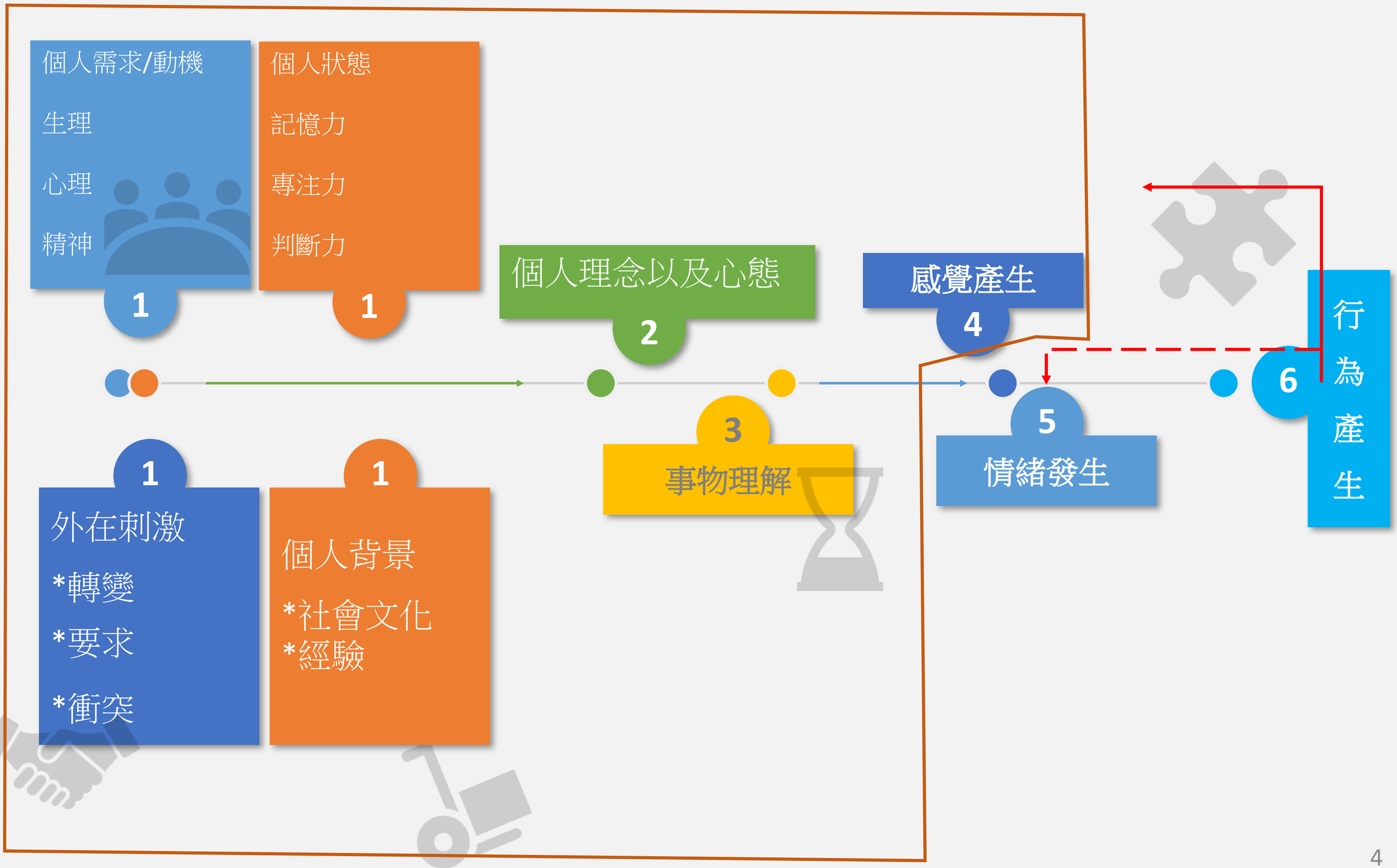
Internal state & construct

Neuro-developmental disorder

Human-centered Analytics

Human-Centered AI:

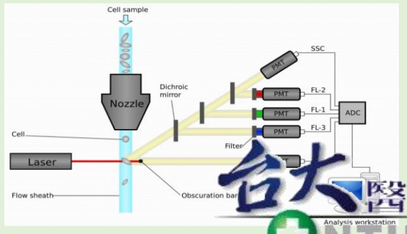
Learning Intelligent Human-centered Analytics from Multimodal Behavior Signals



Our Applications: Human-centered Exemplary Domains
技術應用端

Mental Health

ASD



Flow

EHR

PAIN

Consumer Behavior

EMO-AI

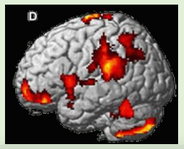
BIIC

Interdisciplinary Research

Affective Computing

EMO-AI

fMRI



NATIONAL HEALTH RESEARCH INSTITUTES
NHRI

Education

ORAL

國家教育研究院
National Academy for Educational Research

Clinical Health

Education

Neuroscience

KEY APPLICATIONS

Affective Computing

Mental Health

Clinical Health

Education

Neuroscience

Consumer Behavior

Interdisciplinary Research: Human-centered Applications

Our Vision: Human-Centric Computing (HCC)
研究願景: 技術藍圖

"...computationally innovate human-centric analytics enabling next-generation decision intelligence"

Cognitive Feedback

Interpersonal Relationship Computing

Fulfillment Empowerment

Value-Sensitive Technology

Affective Feedback

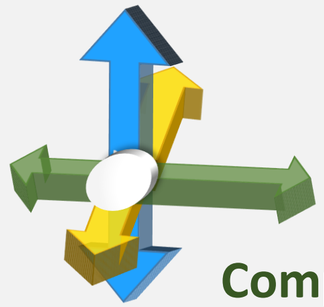
Social Computing

Emphatic Computing

Affect Recognition

Health Analytics

Behavior Computing



Computation Blueprints

Motivation

Internal States

External Functions

Factual → Conceptual → Procedural → Metacognitive