Der Cerebral Functioning Index (CFI):
Eine Theorie über Biomarker für mentale Zustände.
The Cerebral Functioning Index (CFI):
A theory about biomarkers of mental states.

The Body Mass Index **BMI** indicates worldwide, if we have a healthy weight or not. Imagine that there is something analogous for the brain: the Cerebral Functioning Index **CFI** indicates whether a mental state might lie within a healthy range.
Consider a (falsifiable) null hypothesis based on the following assumptions:

1. Psychiatric disorders are (dys)functional mind-body states derived from a disbalance amongst neuromodulators.
2. There exists a mind-body functional marker of mental illnesses: **CFI**.
3. Like a fingerprint, it has individual specificity and longitudinal stability over time.
4. Given a proper algorithm, the **CFI** can be derived from brain activity measurements, e.g. from resting EEG (electroencephalogram).

Think of traces in the sand during different ways of walking. Imagine brain activity variations during a resting state recording like such traces in the sand. These traces will not lie outside a certain range, insofar as a person's step cannot be longer than their legs. Mental disease could be expected to manifest **CFI** values outside a certain range.
An example of biomarkers is the higher theta/beta ratio as a biomarker for ADHD in EEG, whilst the application of alpha asymmetry could be a potential marker for depression. Regrettably, reviews of EEG studies across mental disorders reveal inconsistent results as regards diagnoses or prognoses. Accordingly, there is a need for standardized EEG parameters.
To support the idea that an individual's EEG is not stochastic over time, nonlinear time-series analyses of EEG seem to harbor advantages for analyzing problems of functional states, involving broad frequency ranges whereby the relations between frequency bands are important in comparison with linear analysis.
The nonlinear view assumes EEG measurements to be a product of complex, dynamic processes with possible "deterministic-chaotic" behavior within a corresponding phase or state space. From this point of view, an individual's functional brain state is represented by a so-called attractor, that is, a geometric object within a limited region of the system's phase space in which the above-mentioned behavior takes place.
A biparametric approach to dimensional analysis in terms of a so-called ''unfolding dimension'' has already been introduced to explore the extent to which the human EEG can be described by stable features characteristic of an individual despite the well-known problems of intraindividual variability (Schmid, G. B. and R. M. Dünki (1996). "Indications of nonlinearity, intraindividual specificity and stability of human EEG. The unfolding dimension." Physica D **93**: 165-190; Dünki, R. M. and G. B. Schmid (1998). "Unfolding dimension and the search for functional markers in the human electroencephalogram." Physical Review E **57**(2): 1-8; Dünki, R. M., et al. (2000). "Intraindividual specificity and stability of Human EEG: Comparing a Linear vs. a Nonlinear Approach." Methods of Information in Medicine **39**(1): 78-82.)
Through the "unfolding dimension" as a nonlinear, dimensional approach to measure longitudinal stability and intraindividual specificity, we postulate to find the **CFI** as an individual's marker**.**
So far the theory, and now let's go in search of the algorithm!