

From **ORDYS** and **ORCOS** to **VADOR**

Gustav → Vladimir → Aris

VADOR

(**V**ariational **A**nalysis, **D**ynamics and **O**perations **R**esearch)

Operations research, as area of **Applied Mathematics**, is devoted in developing advanced analytic tools helping in the process of **decision-making**

Decision-making almost always involves an **optimization** of some **objective function** (criterion).

In several **models**, the involved functions are not differentiable. Even if they are, natural operations (max/min, value functions etc) lead to **loss of smoothness**.

This brings us to **Variational Analysis and Nonsmooth optimization** for the theoretical study of such problems (formulating necessary and/or sufficient conditions) and to (nonsmooth) **dynamics** for the study of iterative schemes (algorithms).

Pathologies is the main obstruction in any attempt to formulate a compact theory and design efficient methods.

Remedy: use paradigms to develop a theory inside this "ideal" setting

Convexity

Moderate geometry (RAAG)

cardinality / compactness reasoning

Asymmetry / orientation works in our favor !

Back to basics:

first-order methods, Clarke subdifferential, automatic differentiation ...

Nonsmooth calculus: backward propagation...

It is interesting to see how different domains of mathematics can be harmoniously combined to provide a solid theory.

Stochastic processes, Ito calculus

Tame geometry

Inverse problems, extension results (AMLE, Glaeser Whitney)

PDE, viscosity methods

Unilateral Analysis / Asymmetric structures.