Application of advanced numerical methods in practice

1: side slope stability, bearing capacity

2: interaction of lateral squeezing (and heave?) of very soft clay ($c_u = 10\text{kPa}$) with pre-existing piled structure

settlements not really an issue

rate of construction of fill: is soft clay drained or undrained?

influence of drainage on amount of lateral movement
Application of advanced numerical methods in practice

1: side slope stability, bearing capacity

use standard techniques for design

strength/deformation properties of landfill??

sand: correlation of Mohr-Coulomb strength with SPT $N=4$

very soft clay: $c_u=10\text{kPa}$: Cam clay? drainage? permeability?

very stiff clay – treat as rigid boundary
Application of advanced numerical methods in practice

2: interaction of lateral squeezing (and heave?) of very soft clay ($c_u = 10$ kPa) with pre-existing piled structure

existing bridge – no possibility to isolate piles – but presence of piles will not affect lateral movement

numerical analysis – 2D FE with superimposed structural and soil elements – ensure connectivity of soil

detail of interface between piles and soils (especially soft clay)??
2: interaction of lateral squeezing (and heave?) of very soft clay ($c_u = 10\text{kPa}$) with pre-existing piled structure

or ... simple analysis of interaction of moving ground with piled structure
reduce to dimensionless elements
profile of ground movement $\delta$ unknown – relative movement $\Delta$
pile:ground interaction – earth pressure $K$, asymptote $K^*$ ($\approx 2$), 'stiffness' $\beta$
2: interaction of lateral squeezing (and heave?) of very soft clay \( (c_u = 10\text{kPa}) \) with pre-existing piled structure

MATLAB solution (or Excel)

development of pile top displacement and toe moment depends on *relative* stiffness of pile:soil interaction \( \beta \) and pile \( \chi \)

*stiffness* of pile:soil interaction most important characteristic – and hardest to estimate – pressuremeter tests?