Performance through *thickfolds*\(^1\)
approaching climate-responsive behaviours through shape, materialisation and kinematics.

Addressing adaptive solutions to architecture requires responding to a changing climatic environment instead of statically resisting it. As the demands on the performance of contemporary buildings and their climate-skins are increasing, new alternative, eco-effective and resource-saving approaches are essential. The ability of adaptation opens – like in nature - the perspective to optimise climatic behaviour within a given local context.

The principle of folding contains dynamic aspects with the capability both to adjust shape through its changing geometry [form] and the specific movement embedded in the fold pattern [kinematics].

In this PhD project, folding is investigated phenomenologically, exploratively as well as experimentally, to exploit and document on how climate-responsive performance potentials can be utilised in architecture. ‘Origami technology’, as the emerging, cross-disciplinary field behind it, transfers principles from the ancient art of paper folding into sophisticated design applications.

The project proposes an initial concept, which was developed through explorative design studies, to preserve the foldability of the material despite the thickness of a (sandwich) panel. It is referred to as the *thickfold* concept.

Performance aspects are empirically investigated in three main test series which focus on *shape [change]*, *materialisation* and *self-actuation*. The methods of investigation cover dynamic computational simulations, climate laboratory tests and material tests for thermo-responsive behaviour.

In summary, this project identifies and indicates climatically beneficial aspects based on the dynamic principle of folding and through the materialisation towards a *thickfold*.

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\(^1\) The notion of *thickfold* in this project is defined as: Thick, rigid foldable material entity, with a thickness of a plate or sandwich element.