**Supplementary Material**

The supplementary materials are available via the link https://www.youtube.com/channel/UCg33-8JbRoUJ0tU6LlN\_88A

Table of supplementary materials

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| Serial number | Material type | Description |
| 1 | video | A video of an experimental evaluation from Section 3.2. The video demonstrates the bending process of the soft actuator and its maximum bending angle under the air pressure 45 kPa. |
| 2 | video | A video of an experimental evaluation from Section 4.2. The video demonstrates the stiffness variation of the granular jamming structure with different negative pressures.  |
| 3 | video | A video of an experimental evaluation from Section 4.3. The video demonstrates that the gripper can grab the maximum masses without vacuum pressure and with vacuum pressure. |
| 4 | video | A video of an experimental evaluation from Section 4.3. The video demonstrates that the gripper can grasp some items successfully using two soft actuators with the particle jamming structure. |