



# Task 2 (February)

## Smoothing the Slope

❄️ The ski season is in full swing ❄️

Fresh snow, sunshine, and perfectly groomed slopes — that's what every skier dreams of. But behind every smooth ski run, there is hard work: snowcats and grooming machines constantly remove bumps, level uneven terrain, and prepare the slope for safe and enjoyable skiing.

Now it's your turn: Your challenge is to **design and program an mBot2 robot that helps smooth a bumpy ski slope** by removing obstacles from its surface — efficiently, autonomously, and within a limited time.

Prepare a model ski slope as a flat horizontal surface with a clearly marked working area of exactly  $1 \text{ m}^2$ , outlined by a black line. You may choose any shape you like, but each side must be longer than  $30 \text{ cm}$ . The shape, dimensions, and area calculation must be explained in your documentation. At the start of the experiment, place 20 small "bumps" randomly inside the marked area. These can be Lego pieces, coins, dice, paper balls or similar objects of comparable size and weight. The robot's goal is to remove as many bumps as possible by pushing or sweeping them outside the marked area.

After the start, the robot works fully autonomously for 2 minutes. When the time is over, stop the robot and count how many bumps remain inside the slope. Perform at least two attempts with different random placements of bumps and document the results. You may modify the robot mechanically to improve performance. A simple plow or sweeper not wider than  $10 \text{ cm}$  can be built from cardboard or similar materials, but attachments made using a 3D printer will be preferred. The robot may move systematically or randomly — the strategy is entirely up to you. Partial success is also acceptable, and reliability and repeatability matter more than perfect results.

Your submission must include a short solution description, an area calculation, a video showing at least two full runs, photo documentation of the setup and robot, and the complete program used to control the robot.



Groomer in Zermatt, Switzerland. Photo by [Christian Buerqi](#)