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3D Printed Hands, Tools Co-Created by Singapore Non-Profit Group Plug Assistive-Tech Gaps



Irene Lim, 38, lost her limbs after being infected with sepsis two years ago. – ST

Living independently became a challenge for 38-year-old Irene Lim after part of her forearms and legs were amputated in 2023 due to sepsis triggered by an unknown bacterial infection.

She could not afford prosthetic arms as she had already spent her life savings of around $300,000 on her treatment, pushing her to seek alternative solutions.

Things changed in early 2025 after her dragon boating coach introduced her to Salvage Garden, a non-profit group dedicated to creating assistive devices for people with disabilities and their caregivers.

Salvage Garden, run by 40 volunteers who work in sectors such as tech, design and engineering, holds workshops at libraries in Punggol, Tampines, Woodlands and Jurong every Sunday.

“I started going for their sessions every Sunday at Punggol Library, and worked with them to create tools based on my needs,” said Lim, adding that she would give feedback on how to improve comfort and practicality.

Just a few weeks later, she found herself being able to eat and put on make-up independently using a free set of 3D-printed tools that allow her to strap on utensils, back scratchers and make-up brushes to her limbs.

Since relocating from Malaysia to Singapore in 2016, she had worked as a beautician, and is now in search of a new job.

Lim numbers among the thousands of participants to have attended co-creation sessions with Salvage Garden since 2023.

Sessions are held at the MakeIT space within these libraries, which allows participants to use 3D printers, printing filament and digital cutters (machines that precisely cut fabrics, vinyl and metal) for free with the guidance of Salvage Garden volunteers.

More complicated designs involving materials such as metal rods, screws and plastic boards may come at a small price.

Designs for one-handed nail cutters, plastic prosthetic hands and assistive chopping boards can be original, or obtained from open-source sites such as Thingiverse.



Salvage Garden co-founder Saad Chinoy (left) with volunteer Yeh I-ling. – ST

Salvage Garden was co-founded by tech entrepreneur Saad Chinoy in 2023. He and two other founding members were volunteers with local charity Engineering Good, which focused on refurbishing donated laptops for low-income families to work and study from home during the Covid-19 pandemic.

The trio felt that solutions needed to be co-created with beneficiaries to better meet their precise needs, Chinoy said during an interview with The Straits Times.

“The tried-and-tested formula of treating beneficiaries as recipients in the social service space wasn’t really working,” said Mr Chinoy, who is also co-founder of Singapore start-up SpudnikLab, which focuses on bringing digital skills and tools to underprivileged communities.

“We wanted to try and change that by involving the user of assistive devices, or their caregivers, in the design and prototyping process.”

What began as a small initiative with only a handful of volunteers at one library has grown into an operation run by volunteers who are professionals across fields including engineering and design.

Among them is Dr Yeh I-ling, an assistant professor teaching occupational therapy at Singapore Institute of Technology.

“I joined as I feel that there is a place for such services in occupational therapy. Currently, hospitals and clinical services don’t do much 3D printing, and I think this is because there is a lack of understanding on how to do it, and an uncertainty of how to integrate it into clinical processes,” said Dr Yeh.

“When I first joined Salvage Garden, I didn’t know much about it either. But I just felt like with my background in understanding disabilities, biomechanics and ergonomics, I could help engineers better understand the challenges that disabled individuals might encounter.”

After two years of volunteering, a moment that stood out to her was helping to create an assistive tool that allowed a patient with partial paralysis to use chopsticks.

“That day, she was very happy because she hadn’t been able to use chopsticks to eat noodles since she suffered a stroke,” said Dr Yeh, who added that such seemingly small improvements can make a big difference to someone’s quality of life, which drives her to continue her work at Salvage Garden.

“Patients are discharged from hospitals once they can eat – it doesn’t matter whether it is with a fork or spoon.

“But there is a gap to close between being functionally fine from an administrative point of view, and reaching meaningful outcomes for people. That gap is one that the Government doesn’t pay for.”

This holds true for Lim, who continues to occasionally use the tools from Salvage Garden despite receiving a robotic prosthetic arm from a sponsor in August. In the beginning, her arm would become sore quickly, as wielding the arm felt akin to lifting dumbbells.

Although she has grown used to its weight now, she still finds it more convenient to use the 3D-printed tools at home for simple tasks such as eating, as they allow her to avoid fatigue.

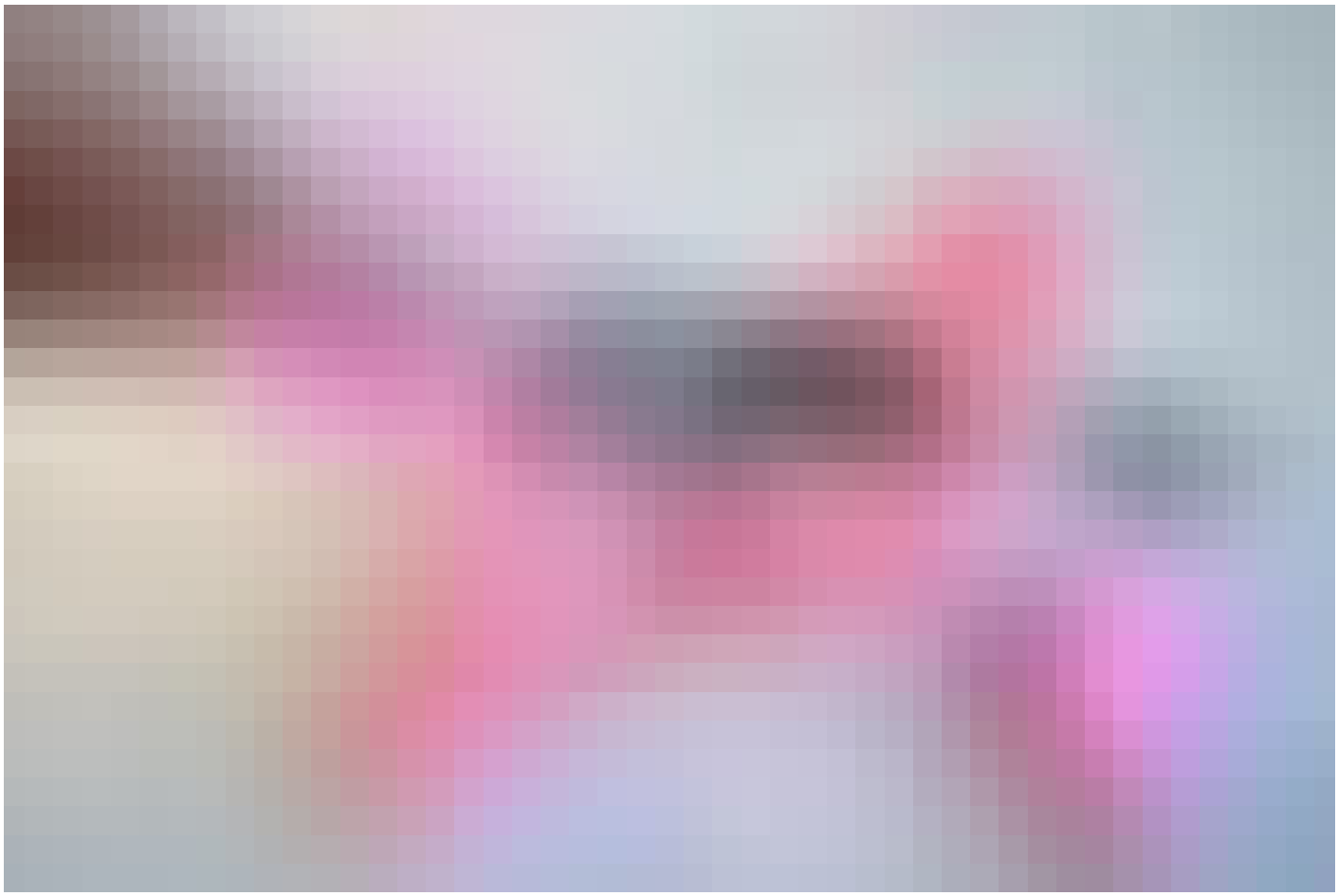
“Hospitals helped with my physiotherapy after I was discharged, but they don’t focus as much on assistive devices. A group like Salvage Garden is hard to come by, and helps to fill a gap in the medical sector,” said Lim.

For patients or clients that need it, there isn’t a clear referral path for parties to come together to co-create assistive technology, said Dr Yeh.

“I am hoping that this can become a formalised service in Singapore. If that is the case, then we wouldn’t need a Salvage Garden.”

Other 3D-printed tools to plug the gap

1. One-handed nail clipper

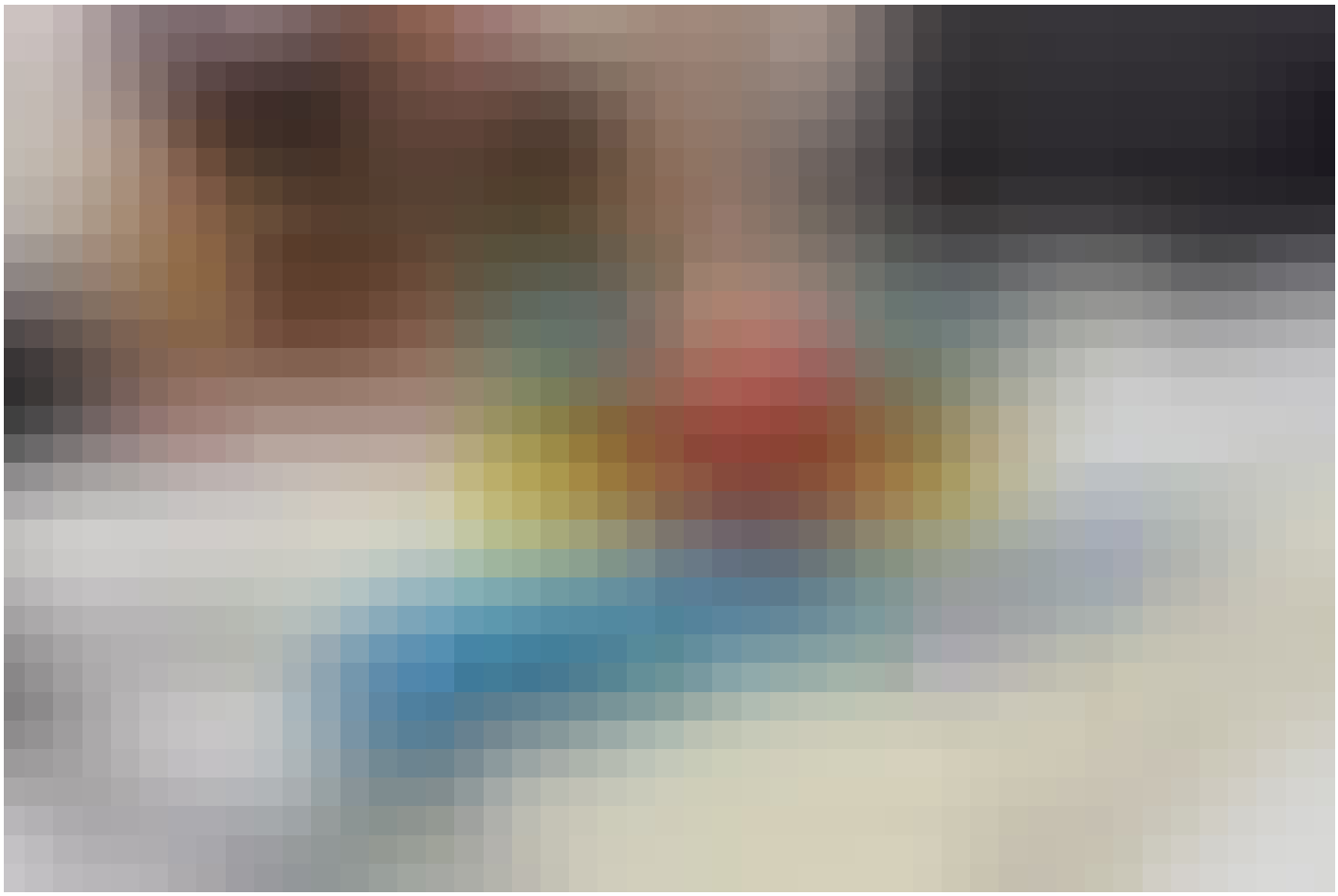


A low-cost version of this tool was created with 3D-printing filament, cable ties and a regular nail clipper. – ST

Though regular nail clippers can be found in stores for just a few dollars, one-handed clippers can cost upwards of $50 on online shops. A low-cost version of this tool was created with 3D-printing filament, cable ties, and a regular nail clipper.

With the finger positioned in front of the clipper, users simply need to press down on the tool to cut their nails.

2. Assistive chopping tool



This tool allows users to cut food items into evenly sized pieces. – ST

This tool, which allows users to lock in place a chopping block at the bottom, allows users to cut food items into evenly sized pieces.

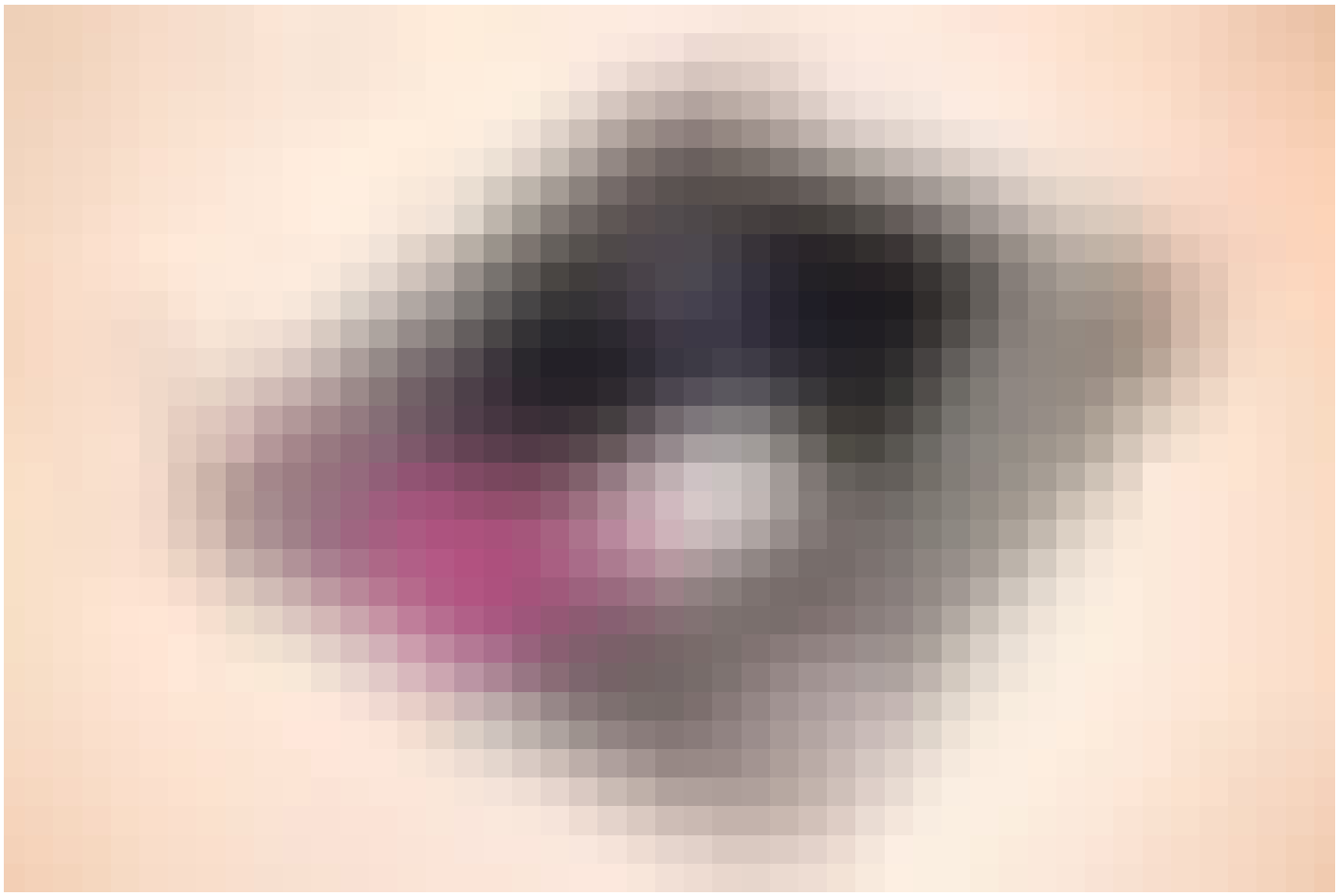
Around 30 sets were created for adults with intellectual disabilities, after social service agency Minds reached out to Salvage Garden to co-create these tools.

“Most of our clients do not have strong motor skills, and tend to cut only with their dominant hand,” said Julia Ng, manager of befriending and respite at Minds.

“With this chopping aid, clients can cut food into a consistent size while holding onto the ingredient.”

Ground-up initiatives like Salvage Garden are flexible and responsive to the needs of clients, and the inherent versatility of 3D printing allows for low-cost customisation along with ongoing experimentation, said Ng.

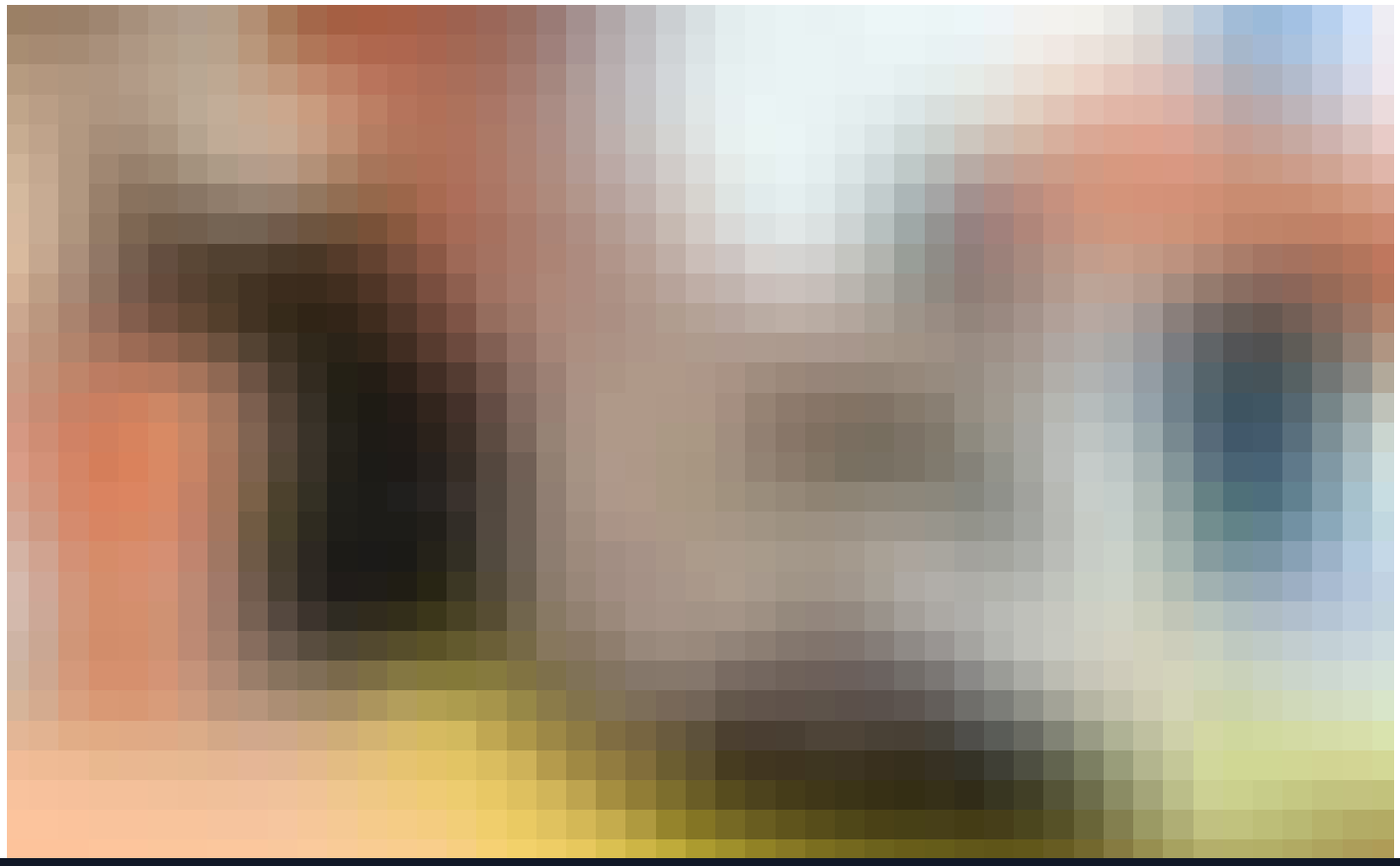
3. Drawing board to help with grip issues



Designed for individuals with grip issues, this 3D-printed pen holder provides stable support for writing and drawing. – ST

Designed for individuals with grip issues, this 3D-printed pen holder provides stable support for writing and drawing. The pen holder can move in all four directions along metal rods at the side, while keeping the pen fixed in place.

4. Connect 4 for the visually impaired



FBI Publications (M) Sdn Bhd
J-3F-1, Encorp Strand Garden Office
No 12, Jalan PJU 5/1, Kota Damansara,
47810 Petaling Jaya, Selangor, Malaysia

+603-6151 9178

my@asiafbi.com

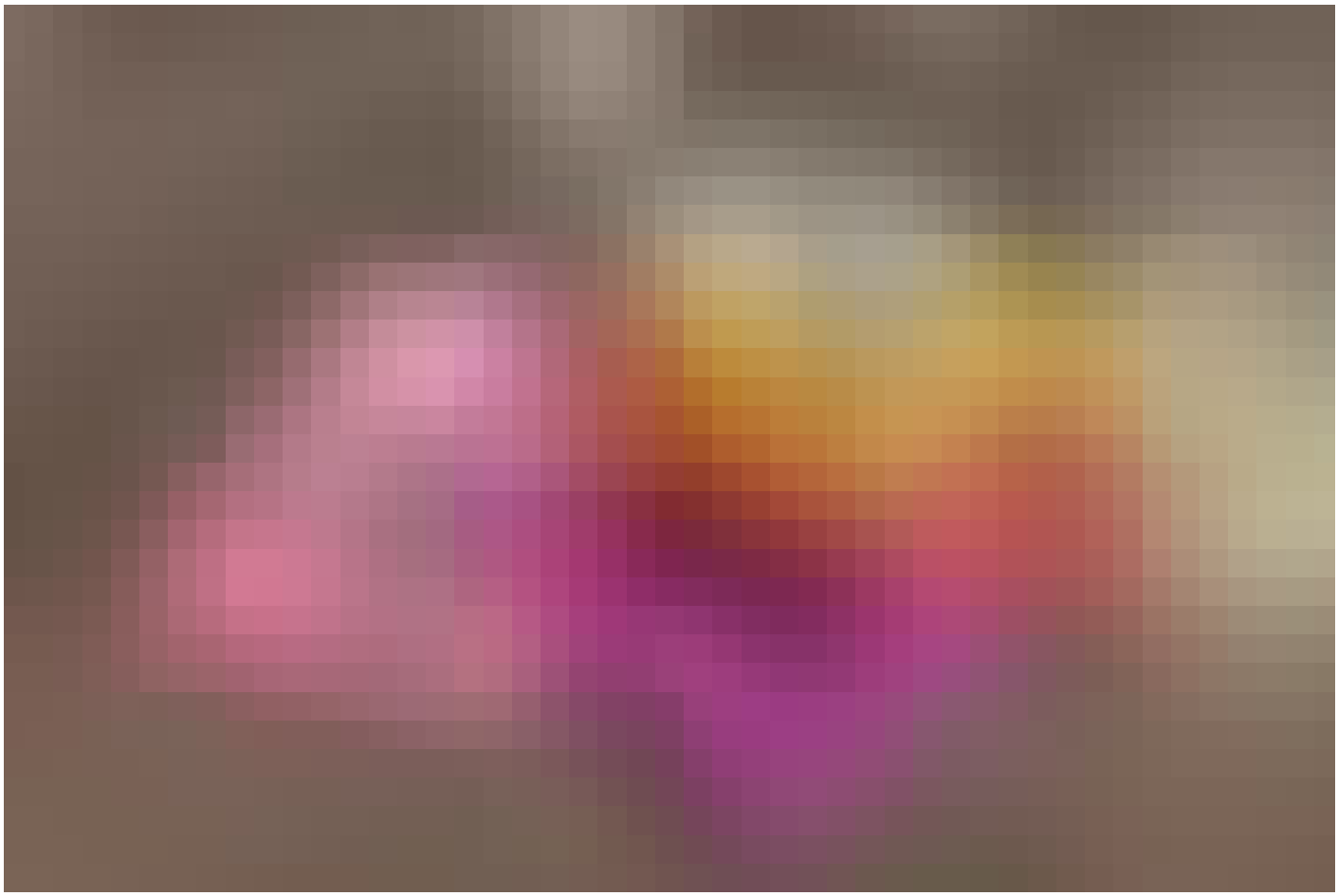
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