

Deliverable 4.3 – Technology transfer on HEClab

Version 1

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Objective of the deliverable

This deliverable focuses on the technology transfer activities, supported by the developed HEClab platform. It shows how the results of the HTEs (Humanizing Technology Experiments) have been transferred into prototype cards. The prototype descriptions represent the initial step in the in-project technology transfer –the created components can be adapted to new contexts and reused by new projects in the future. The success of this effort will be evaluated in month 36 and reported in the follow-up deliverable D4.7.

History of changes

Date	Version	Author	Comment
12.06.24	0.1	Klara Kaluzikova	Setup of
			deliverable
15.06.24	0.8	Pavel Smrz	Information about
			the technology
			transfer forms in
			the HEClab
27.06.24	0.8	Lija Groenewoud van Vliet	Review
28.06.24	1.0	Pavel Smrz	Final version

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1. Abstract

The technology transfer of the prototypes developed within the Hungry EcoCities project takes various directions – the technologies are directly reused by artists and involved academic teams in linked projects, the art studios build on the knowledge from the supported experiments, and external bodies can involve in adapting the developed technologies presented at our public events.

This deliverable focuses on the technology transfer activities within the project itself, supported by the developed HEClab platform. It introduces the initial prototype cards that resulted from the HTEs (Humanizing Technology Experiments) and were entered by the submitting of the deliverable to the HEClab platform. The prototype descriptions in the form of the cards represent the initial step in the in-project technology transfer – it is supposed that the created components will be adapted to new contexts and reused by new projects. The success of this effort will be evaluated in month 36 and reported in the follow-up deliverable D4.7.

2. Technological transfer cards resulting from HTEs

This deliverable reports on the initial step towards the technology transfer activities in the Hungry EcoCities project. As defined in other deliverables (primarily in the conceptual and architectural D2.2 – HEC Virtual FabLab Framework Architecture), the technical means to realize the technology transfer in the project is provided by the HEClab – a web-based tool interconnecting art-inspired prototypes with opportunities defined by application partners. As the actual technology transfer linked to the nine initial HTEs is supposed to happen when the SMEs selected in the second call as end users define their opportunity cards and match existing HTE prototypes, this document just summarizes the information entered into the HEClab system by June 2024 and provides evidence (by screenshots from the system) that the initial prototype cards were entered to HEClab according to the plan. The final deliverable on the technology transfer activity (D2.7) will be submitted after the second call is finished and the actual results of the transfer are known.

The following screenshot shows the list of available HTE prototypes (or prototype card proposals) in the HEClab system. This demonstrates an administrative view on the

prototype cards (proposed by their authors and approved by an area administrator). To initiate the process of the technology transfer, the opportunity provider would define its needs and requirements, the system would suggest relevant prototypes matching the description of the opportunity, and the potential end-user could realize the transfer.



Ecoshroom-Al

The prototype card defined by Ivan Henriques aims at the technology transfer related to the results of the Ecoshroom-AI experiment. It addresses the questions of future crop resilience and growth by exploring in-soil symbiotics among crops and mycorrhizal fungi. The prototype card is shown in the following picture.



SYMPOSIO

The SYMPOSIO prototype card authored by Yiannis Kranidiotis targets potential applications interested in the technology transfer enhancing the dining experience and promoting healthier eating habits by reducing automatic or mindless eating with the use of light and AI. Restaurants or other interested eating place providers could employ the system that analyses the audio environment at the table, dynamically adjusts the intensity and colour of the lights, and generates light signals tailored to encourage predefined conversation/eating scenarios. The screenshot is shown in the following image.

SYMPOSIO								Share Edit 🖉	Delete
03/06/2024 🛛) SYMPOSIO								
Outcome Type	Technology		TRL Level		Author	Yiannis Kranidiotis			
Description									-
SYMPOSIO is a	an art-driven technolo	gy prototype that aims to enh	ance our <mark>dining exp</mark>	rience and promote healthier eating habits by reduc	ing automatic	or mindless eating with the use of light and Al		P. C. P. L.	
The system co encourage eith The software i	ntinuously analyses t ner eating or conversa s written in Python an	he audio environment at the tr tion, following predefined sce d can be executed locally on a	able using AI, dynam narios. any computer. The u	cally adjusting the intensity and colour temperature sed WiZ lamps can be placed in any existing light fix	of the lights. A ture. For the c	additionally, it generates light signals tailored t enterpiece, the STL files are available.	° < (>
Currently, 5 sc More test and	enarios have been pri experiments are need	ogrammed with the first test n led on the effectiveness of the	esults. The audio ha e scenarios, new sce	been clustered into six categories: speech, eating, narios can be added to the system.	silence, music	joy and loud.		and the second	
SYMPOSIO is to	ocusing on creating a positively impact the	n immersive dining experience ating ritual, encouraging indiv	 It encourages indi riduals to eat more s 	iduals to be present, mindful, and appreciate the co owly, with greater care, and attention, and perhaps (mmunal act of even altering t	sharing meals. heir eating habits.			0
Tags									
obesity co	nsumers user int	erface applications (UI/UX)	machine learning	Al) additive manufacturing (3D printing) eat	ing light	restaurant sound technology			
③ Benefits	🖉 Links 🔲 Refe	rences							
The project air Additionally, th It also seeks to Finally, Sympo	ns to enhance individ te project seeks to cre o explore the impact o sio is trying to raise a	uals' awareness of hunger and tate a more enjoyable and sat f mindful eating on digestive h wareness about the creative u	fullness cues, foste sfying dining experi- nealth, with the goal se of light in dining,	ring mindful eating habits. nee through the light, and culinary elements. of providing insights for potential improvements in th while encouraging individuals to be present, mindful	is aspect. , and apprecia	te the communal act of sharing meals.			

MVP x FFF Food Computer

Owners and managers of food forests (three-dimensional edible-plant gardens that attempt to mimic the ecosystems and patterns found in nature) should be interested in technology transfer from the MVP x FFF Food Computer prototype. The technology created by the Genomic Gastronomy artistic group employs the large language models to remix ingredients based on harvest dates and user preferences and create novel recipes with non-animal proteins. The screenshot of the prototype card is shown below.

MV/P x EEE Food Computer						Share Fell Delete
wive x FFF Food Computer						
03/06/2024 D MVP x FFF Food Computer						
Outcome Type Technology	TRL Level	4	Author	Genomic Gastronomy	and the second	
Description						
The MVP x FFF Food Computer is an Al-assisted thinking from food forests (FFFs)) and Alternative Proteins (Comm high-protein food products a.k.a. Minimum Viable Proteins	and tinkering tool for harm ercially available, non-anim a (MVPs)).	onizing the rhythms and o al derived	culinary (& nutritional) possibilities of Food Forest	Flavours (ingredients grown and harvested		A COLORAD
The computer remixes ingredients based on harvest date	s and user preferences, cre	ating novel and delicious	recipes that are ecologically-minded and nutritio	nally-complete.		
Instead of trying to create one perfect approach to agricu alternative protein production and agroforestry.	Iture, this artistic research	project uses artificial intel	lligence to graft together two visions of the futur	e that are usually pitted against each other:		1 and a start of the start of t
But can high-tech, hyper-efficient proteins pair well with r farming typologies through recipes and flavor.	egenerative microseasonal	ingredients in the kitchen	n? The MVP x FFF Food Computer connects thes	e two complementary, but differently optimi	red,	NORCHINE !
The current prototype is tested in the Netherlands with an MVPs and food forests can be added.	vailable data from available	MVP ingredients and sea	son products from selected Food Forests. The sy	stem is created in such a way, that new dat	• on	
The tool was built to explore if and how digital tools and A those from hyper-efficient alternative protein producers). The tool was built to generate cockable recipes that user textual and edite treatist of the food computer, consideri both the accuracy, applicability and process by which this	I can aid in the creation of s (in our case, the Center fo 19 s knowledge was created, a	viable and desirable recip r Genomic Gastronomy) c s well as what forms of cu	es from novel ingredient combinations (specifica can serve to the public via a pop-up food stand, ulinary knowledge are included or excluded using	Ily those from hyper-resilient food forests an creating a forum to reflect on and evaluate th g LLM (large language model) tools.	id e	
Tags						
fruits (vegetables) (land use) climate resilience	lab grown food pro	widers / growers tran	nsports / distributors large language models	(AI / LLM) trees flavour		
alternative protein local production						
⊙ Benefits & Links □ References						
		a materia la seconda da seconda d	the first first and shares the second state			

Council of Foods

The technology of the Council of Foods prototype developed by artists from Nonhuman Nonsense corresponds to an interactive website built to create a space for discussing the broken food system. As food representatives themselves participate in the council, the prototype offers a playful entry point to engage general public in the discussion on the current food systems. The prototype card is shown in the figure below.



SYMbiosis.ai

The digital prototype created by Frederik De Wilde – SYMbiosis.ai – explores the concept of plant stress. The developed technology functions as a visual dashboard, interface, and digital hub that allows to connect with a diverse set of hardware and sensors, to monitor the natural environment as well as man-made infrastructures, environmental pollution, and plant stress.

Machine learning models and generative AI are employed to analyse, fuse, and process data characterising plant conditions. The prototype card is demonstrated in the following image.



Future Protein

The primary target group for the technology transfer of the Future Protein prototype is formed by owners, managers, and enthusiasts of mussels and mussel farming. IM-A Studio, formed by Katya Bryskina and Nataly Khadziakova, created and documented the Mussel ID – a remote-sensing model that predicts the development of mussel farming and shows its potential in terms of nutrition and ecological value in the immediate future or up to 100 years from now. The prototype card is shown in the screenshot below.

Future Protein					< Share Edit / Belete
03/06/2024 D Future Protein				attempointee	Construction of the State of th
Outcome Type Economy	TRL Level 4	Author	IM-A Studio by Katya Bryskina & Nataly Khadziakova	· terring	(market)
Description					and the second second second
Mussel ID is a Remote-Sensing model that predicts the development of	f mussel farming and shows its potential in terms of	of nutrition and ecological value now and	potentially in 50 and 100 years.	Territoria	
The model incorporates data patterns from existing mussel farms across size of the farm they want to create and the number of months before to connected through a formula we developed. The formula can also be in	ss various locations and uses satellite imagery to the harvest and get the calculation of all the bene terpreted in different ways, targeting the different	extract and predict key parameters for ful fits they would gain in terms of protein re t results aimed at various user groups.	ture development. Currently, the users can introduce the sources and environmental credits. All the parameters are	< -	
Tags					
yield climate resilience shellfish predictability circular	Ity biomaterials food waste traders	user interface applications (UI/UX)	sensoring (machine learning (Al)		and another and an and an
additive manufacturing (3D printing) satellite image processing	aquaculture			and the second	
				1.12	
Benefits Ø Links					
The prototype has many opportunities and potential directions.					
the formula links the nutritional value of food (in this case, mussels) is	with the environmental consequences.				
digital interface can potentially inform the user about the environment	ntal benefits of one food over the other				
the prototype shows benefits for the farmers (or other businesses in	terested in investing in the environmental credit s	ystem) and the ecological value of the mi	ussel farm they grow.		
potential application is to adapt to sea level rise by creating and envi	isioning water communities				
the prototype takes into consideration managing blowaste through b	piomaterial utilisation				
integrating the formula approach and sustainable foods into our culture	ure through informed decision-making, novel recip	es, and interface			

WTFood

The technology behind the WTFood prototype created by Bernat Cuní aims at engaging communities by means of a machine vision model (accessible through the lens of a mobile phone) that recognizes fruits and vegetables and morphs the image to convey the message about the glitches of the food system. Currently the employed large language model is prompted with 5 stakeholder perspectives and 5 socioeconomic issues. However, the system is flexible and customizable, so the potential for the technology transfer in various other contexts is high. The prototype card is shown in the following image.

WTFood				< Share Edit / Delete
03/06/2024 🖸 WTFood				
Outcome Type Society	TRL Level 5	Author	bernat cuni	A DAY RADROPED
Description				
A less and Al module to ancore the globules of the fixed system, explore varior How does it work? That a first or cognitive, speen the current, and work however, the comparison of the system of the system of the system of the Currently, Three works with the following makedown: 1) persistically of a point 2) controls, the system of the system of the system of the 2) controls, the system of the system of the system 3) controls, the system of the system of the system of the 3) control of the system of the system of the system of the 3) control of the system of the system of the system of the system of the 3) control of the system of the system of the system of the system of the 3) control of the system of the sys	a prima seconomic perspective and discrete ways for thin a aplied of the food system. The applicht is the social communities and photomic time of francing displays have been separated with 5 stabilistic perspectives and 5 socioeconomi	tale action. comme impact of an impactions, publicies or mathent forces. one you can talk action. rannes. The stabilities and some could be elaborated and furth	e espanded in the modular system.	
Tags				
(fruits) vegetables empowerment (transparancy inec	uality (inclusivity) (user interface application	a (UI/UX) (machine learning (Al) (large language r	nodels (AI / LLM) augmented reality (AR)	
⊙ Benefits 𝔅 Links □ References				
Wtfood can be useful for many kinds of SME's and associations as t	ne system is robust and built for flexibility and custo	mization. Here are some potential use cases:		
Engaged Communities: As the image classifier can be fine-tuned	to accept photos within very specific categories, as	sociations can leverage the platform to launch challenge	s around (weird) specific themes such as "for	od in the park" or "salads with tomatoes"
Interactive Product Exploration: Companies can create dynamic e	plorable product maps categorized by user-define	d criteria.		

The Vegetable Vendetta

The motivation of the Vegetable Vendetta by Jeroen van der Most technology is to enable small producers of healthy vegetables to compete with big global brands in marketing. The digital prototype and the artistic installation asks visitors to scan potatoes or broccoli using a camera and uses the image to create an Al-generated movie starring the vegetable, using persuasive marketing strategies inspired by global brands. The prototype card suggests the technology transfer by extending the prototype towards any type of vegetable, fruit, or other food product. The screenshot of the card is shown below.



Acoustic AgriCulture

The complex hardware-software digital prototype by Helena Nikonole aims to identify and utilize specific sounds that stimulate plant growth. The potential of the technology transfer lies in advanced trained models, responding dynamically to the needs of living plants and using optimal sound frequencies to influence their healthy growth. It also involves 100 "do-it-yourself" hydroponic boxes equipped with vibrational speakers, custom electronics, and sensors. The prototype card is shown in the following picture.

Acoustic Agriculture					
03/07/2024					
Outcome Type Technology	TRL Level	3	Author	Helona Nikonole	
Collaborators					
Description					
Acoustic Agriculture is a project redefining how we think	about AI, noise pollution, and the biosemiotic relation	ship between sound and plant life.			
Urban noise pollution remains a pervasive issue in our cit aking our cities more liveble and sustainable.	ies, affecting both the well-being of residents and th	ecosystems. This project is a resear	ch into how sound technology, Al, and	hydroponic farming can transform urban agricultur	
To dissect the complex urban soundscape, we collected	a dataset of 100 sounds, categorized into urban noise	pollution, environmental and natural	sounds, and specific pulses that influe	ince plant growth.	
These sounds were the foundation for training an autoen	coder Al architecture to eventually get insights how p	lants respond to varying soundscape	s.		
In partnership with the Laboratory of Mendel University i y to entire plant and closely monitor it's growth by observ	n Brno, we developed a prototype consisting of two h ring nutrient consumption from the liquid.	ydroponic boxes equipped with vibra	tional speakers, custom electronics, ar	id sensors. This setup allows us to apply sound dire	
initial small-scale experiments with targeted sound pulse	s confirmed the efficacy of our setup, inspiring us to	expand the scope to include 100 DIY	hydroponic baxes.		
We are now collecting data and training our custom AI m understand how different sound patterns impact plant gr	odel based on autoencoder architecture and evolution owth.	ary algorithms. This involves tracking	nutrient consumption in real-time and	t measuring biomass and photosynthetic efficiency	
We are also planning to conduct genetic analysis to gain	deeper insights into plant biology.				
While being a technological innovation, 'Acoustic Agricult and nature not just coexist but coevolve.	ure' is also a biosemiotic exploration into plant accus	ics. It's an Al-symphony created for p	elants and a model for future urban fan	ning practices: a post-human future where technol	
Tags					
(vegetables) (mechine learning (AI)) (plants) (sou	nd technology biotechnology plant acoustic	s hydroponics			
O Benafits					
1. Enhanced Plant Growth By applying tailored sound frequencies through advance	d Al algorithms, the project aims to identify and utilize	specific sound patterns that stimular	te plant growth. This could lead to incr	eased agricultural yields in urban environments, su	pporting food security and reducing the need for transport from rural farms.
 Sustainability in Urban Farming By integrating hydroponic systems with sound technolog 	y, "Acoustic Agriculture" promotes water-efficient far	ming methods that require fewer cher	mical inputs compared to traditional so	il-based agriculture. This approach supports susta	inable urban development by minimizing the ecological footprint of food production.
 Scientific and Technological Innovation The project pushes the boundaries of current agricultura atural systems. 	practices by incorporating biosemiotic principles to	explore the relationship between sour	nd and biological organisms. It also adv	ances AI technology by training models to respond	dynamically to the needs of living plants, enhancing our understanding of plant biology and APs potential to interact with
 Biosemiotic Research The project contributes to the field of biosemiotics by pro- 	oviding a practical application of how non-human biol	ogical entities (plants) communicate a	and interact with their environment the	ough sound. This could lead to broader implication	for understanding interspecies communication and the role of sounds in ecological and biological processes.



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Hungry EcoCities aims to explore one of the most pressing challenges of our times: the need for a more healthy, sustainable, responsible, and affordable agri-food system for all enabled by AI. More info: <u>starts.eu/hungryecocities.nl</u>