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# LIFESPAN PREDICTOR - RELIABLE DEEP LEARNING TOOL FOR *IN VIVO* LIFESPAN PREDICTION

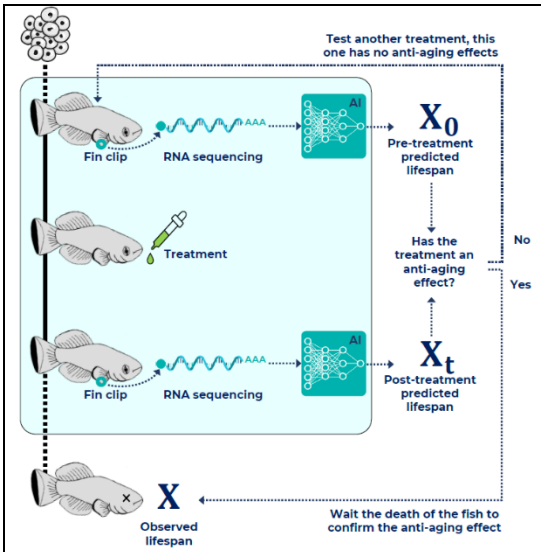
Keywords: artificial intelligence, deep-learning algorithm, life span, health span, biological age, longevity, preclinical model, anti-aging

## INVENTION NOVELTY

The invention relates to a deep-learning algorithm as a predictor for life expectancy and of healthy lifespan, respectively, of an individual useful for investigating the influence of interventions on lifespan, for application in preclinical and clinical studies as well as monitoring the effects of pharmaceutical longevity and anti-aging products on lifespan. For preclinical studies the combination of the *Lifespan Predictor* with a versatile *in vivo* animal model platform established based on the extremely short-lived killifish is of special value.

## VALUE PROPOSITION

As our society continues to age, there is growing interest in the development of age prediction, and the impact of pharmaceutical products on biological age. Previous algorithms have been trained to predict the chronological age of different individuals based on their biological data such as DNA-methylation, however, these tools are highly error-prone and are not predicting life expectancy, but mortality risk. Problematically, the training data being used cannot be standardized, as humans have a long lifespan making data collection over several decades hardly possible, and many further external factors having an impact on health, such as access to health care, confound data. Thus, there is need for an error-resistant algorithm that can be trained with data from a few reliable age biomarkers that could be obtained under standardized conditions.




*Application of the Lifespan Predictor, ©.Ferrari*

## TECHNOLOGY DESCRIPTION

Provided is a deep learning architecture applying an advanced adversarial framework to predict age-related mortality or disease, such as time to death, mortality risk and/or a risk of age-related disease of a subject from biological inputs such as transcriptome data, while being insensitive to a set of custom variables that can affect the value of the input data and mislead the learning process, such as: measurement instrument, non-controllable experimental conditions, etc.. For proof-of-principle the Lifespan Predictor was trained with data obtained from the shortest living vertebrate, i.e. the *Nothobranchius furzeri* fish. Its lifespan of ~12 months makes it possible to continuously monitor its life and collect longitudinal aging data under standardized experimental conditions. The Lifespan Predictor predicts the age of death of these animals with an error far less than 1/100 of their lifespan. a precision reached already in the first quarter of their life. The Lifespan Predictor is sensitive to genetically-, environmentally- and treatment-based pro- and anti-aging effects. Thus, the Lifespan Predictor can be used to accelerate anti-aging drug development by comparing the predicted lifespan before and after a treatment, avoiding the need to wait the age of death.

## COMMERCIAL OPPORTUNITY

The *Lifespan Predictor* and the *in vivo* **k**illifish **i**ntervention **p**latform (KIP) are offered as a service and for licensing, being of special interest to the (pre)clinical development of pharmaceutical longevity and anti-aging products.

## DEVELOPMENT STATUS

An initial proof-of-principle of the *Lifespan Predictor* was achieved with killifish; applicability to humans has already been initially demonstrated; further analysis of human data sets is ongoing.

## PATENT SITUATION

A European priority application was filed in July 2022 (EP22185439.1)

Leibniz Institute on Aging – Fritz Lipmann Institute

**Ascenion GmbH**
Herzogstraße 64
D-80803 München
info@ascenion.de
www.ascenion.de

**Licensing Contact**
Dr. Sabina Heim
Senior Technology Manager
T: +49 531 6181-2090
heim@ascenion.de

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