

## Biological Rhythm Aware Office Lighting Control

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# Biological Rhythm Aware Office Lighting Control

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Chara Papatsimpa is a current a post-doc researcher at TU/e. Her work is concerned with mathematical optimizations for human-centric lighting. Specifically how our existing knowledge on the circadian effects of light can be translated to formal lighting control optimizations.

## Biological Rhythm Aware Office Lighting Control

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What is  
the problem?

We spend  
**90%**  
of our time  
indoors

Evening light  
exposure  
**is high**  
(smartphones, TV)

Indoor light  
levels are low

**85%**  
of people  
use an alarm

Resulting in

“Social jet-lag”  
Misalignment of biological and  
social time

We translate insights from  
chronobiology to practical  
lighting recipes to enhance  
health and well-being  
through offering  
personalized light “nutrition”

Our solution



### Methods

- We use quantatified models of the effects of light on human pacemaker

$$\dot{x} = \frac{\pi}{12} \left[ y + \mu \left( \frac{1}{3}x + \frac{4}{3}x^3 - \frac{256}{105}x^7 \right) + B \right]$$

$$\dot{y} = \frac{\pi}{12} \left\{ qBy - \left[ \left( \frac{24}{\tau 0.99729} \right)^2 + kB \right] x \right\}$$

- We formulated the system as a formal mathematical optimization problem
- Inroduced a novel algorithm to solve the highly non-linear problem

Personalized lighting pattern  
for every employee

Light profile depends on history  
of light exposure, user habits and  
preferences

