This is a graduation project report by Kinnat Soley Lydon from the department of visual communication at the Iceland Academy of the Arts in 2016.

1 A short introduction to the Devanagari script → Devanagari is one of the most used scripts in the world, used to write over 120 languages. These languages include Hindi, the most prominent language in India, Marathi and Nepali, as well as being used for Sanskrit manuscripts. Despite being widespread and used by millions, the script's typographical needs have been insufficiently met in past and present typeface design. Devanagari is a complex script containing a large character set produced by unique typographical behaviors. I began researching the Devanagari script in my Bachelor thesis Designing Devanagari Type. In the thesis I explored the process of designing typefaces for the script, as well as the many technological restrictions the script has faced in printing technology, which have a direct effect on how it is designed today. As a continuation of this research, I decided to design a Devanagari typeface as my graduation project.

→ One of the biggest complications faced when printing the script is its extremely large character set. This character set is caused by a unique typographical behavior, which happens when two or more consonants are written consecutively. The consonants merge together creating a new ligated consonant or conjunct. The number of these conjuncts is vast due to the many possibilities of merging – all consonants can merge with each other, and conjuncts can contain up to four consonants. Recent Devanagari typefaces usually contain between 1000–2000 glyphs, the largest portion of them being conjuncts. These conjuncts are most commonly horizontal, but can also stack vertically or be completely unique to the consonants involved. Another unique behavior of the script are the vowel marks or matras. They occur when a vowel is written next to a consonant. The vowel transforms into a mark, attaching to the affected consonant.

→ There are various other marks in the script, for instance the consonant r or a attaches to affected characters with either a rakar mark or a reph, placed in sub- and superscript positions. Printing a script with such a large and complex character set was a challenge, and from the days of hot metal type the script and its legibility has been affected by incorrect rendering.

→ The legacy of printing restrictions carried into the digital age as the first standard digital font formats of the 1990s, TrueType and PostScript, could only store up to 256 characters. The breakthrough came in the early twenty-first century with the development of OpenType fonts, where all character set constraints were removed, allowing a maximum number of 65,536 glyphs in a single font. OpenType specifications were also developed for contextual alternatives and other typographic behaviors crucial to Devanagari, allowing for these features to be easily coded into the typeface.

2 The idea and process → I came across an article on the difficulties in rendering Devanagari characters in the early days of computers, as screen resolution was low and the character shapes more complex than Latin ones. This made me think of the pixel fonts of the early digital age. I researched non-Latin pixel typefaces and found Arapix – an Arabic pixel font with plenty of OpenType features to fully support the scripts complex typographical behaviors. I wanted to design a Devanagari pixel typeface that would support all of the scripts marks, ligatures and behaviors. Since computers now have excellent resolution there is no longer a need for low-resolution computer typefaces such as pixel fonts. However, dot matrix typefaces are still used for many applications, such as in thermal printers and LED displays.

→ LED displays in India are prominently used both in public transportation and their accompanying stations. Pooja Saxena, an Indian type designer, documented the typefaces used in these displays and critiqued their design. Many of the typefaces are seriously flawed — some have inconsistent contrast and strangely designed letter shapes, others are missing marks or ligatures. These flaws seriously affect readability. The New Delhi Metro system serves an average of 2.4 million passengers a day, creating an extremely large number of typefaces. Searching the Internet for Devanagari pixel fonts turned out to be difficult and even the existing typefaces available are incomplete and inconsistent in design. I decided to design a Devanagari pixel font focusing on use in dot matrices such as LED displays.

3 The design → Using the description of the process of designing Devanagari typefaces from my thesis as a guide, I looked at all kinds of type designs. These included both current and historical samples. Calligraphy guides and contemporary typefaces were used to gain a feel for the construction of the characters. This also helped with understanding which design features were stylistic and which elements constitute the script original structure. Classifications of the graphic structure of the script, such as the ones by Dr. A. V. Bhagwat in Typography of Devanagari, determined which characters shared similar shapes, helping to keep proportional consistency in the typeface. I chose the name Khand, Hindi for unit or component, to refer to the pixel construction, as well as the conjuncts of the script being composed of components.

→ I started by deciding the size of the grid to work with, wanting to keep it as compact as possible. Devanagari vowels and consonants share a consistent x-height, but due to the script's typographical behaviors, the characters need a large amount of space above and below them. This is to allow for vertically stacked conjuncts and mark placement in sub- and superscript positions.

→ I began designing the characters with a 10 pixel x-height, quickly changing it to 8 pixels when I realized it had little to no effects on legibility. This x-height was smaller than what was used on the typeface samples found in public transportation, leaving more...
space for conjuncts and marks. I decided to start with a minimal character set and no Latin letters, around 603 glyphs. Then began a process of getting feedback and refining the character construction. I received feedback from two Devanagari type designers; Gunnar Vilhjálmsson and Pooja Saxena, who wrote the critiques on the typefaces used in public transportation in India. They helped me simplify the shapes, as early designs contained many calligraphic elements, something not very fitting to a pixel font. I then received critiques from three native speakers, gaining helpful insight on how to increase the legibility of the typeface.

As the typeface was intended for use on dot matrix displays, I started researching them very early on in the process. During this research I came across some technological restrictions that also had an effect on the design of the typeface. Dot matrices almost always come in eight by eight pixel components. Using multiples of eight, I first attempted to shrink the grid down to sixteen pixels. This however had dire effects on the readability of vertical conjuncts and marks so I decided to expand the grid to 20 pixels, fitting to a 24 pixel dot matrix. I re-drew the characters into a LED sign font editor and worked with a programmer to program them into the display. The sign displays metro stations in English and Hindi, as well as some of the typographical behaviors explained in the type specimen.

The typeface design was a research on fitting the complex characters and behaviors of the Devanagari script into a compact grid. During this research I discovered many things that could explain the flaws of the current dot matrix display typefaces in use in India. Apart from the design of the typefaces themselves, technical aspects involved in programming the actual displays are also restricting. In the display I used for the exhibition, it was impossible to program all the characters and behaviors into the sign due to lack of memory space. Although inputting pre-determined words and characters into the display is not a problem, programming a sign allowing for free inputting would be a tremendous feat. This creates the problem of the user of the display requiring programming skills or access to a person with this skill set to operate and change the text on their sign. For signs with set displays such as metro station names this is fine, however problems arise when the user would need to input custom messages. As there is no available Devanagari pixel font available for purchase, for instance for announcements on delays or security. The need for better Devanagari dot matrix display typefaces is therefore twofold: on one hand there is a need for better designs, and on the other there is a need for a better program to control the displays themselves. I feel I have addressed the former in my design, creating compact but legible characters with great detail to the consistency of the forms.

As a conclusion, this project is not so much of a final project as the beginning of one. I intend to develop the typeface further by continuing to receive critiques on my design by type designers and native readers of the script, including legibility tests conducted on the LED display. I would like to publish the typeface on the Internet, as there is no available Devanagari pixel font available for purchase as of now. Furthermore I would like to develop the typeface with help from a programmer and look for possibilities of implementation on dot matrix displays in India and Nepal.