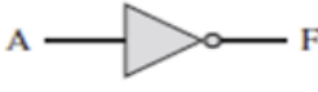
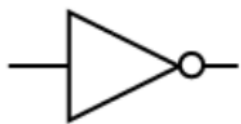
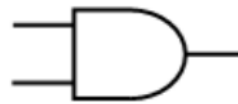


Name	Graphical Symbol	Algebraic Function	Truth Table															
AND		$F = A \cdot B$ or $F = AB$	<table><tr><th>A</th><th>B</th><th>F</th></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td></tr></table>	A	B	F	0	0	0	0	1	0	1	0	0	1	1	1
A	B	F																
0	0	0																
0	1	0																
1	0	0																
1	1	1																
OR		$F = A + B$	<table><tr><th>A</th><th>B</th><th>F</th></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td></tr></table>	A	B	F	0	0	0	0	1	1	1	0	1	1	1	1
A	B	F																
0	0	0																
0	1	1																
1	0	1																
1	1	1																
NOT		$F = \overline{A}$ or $F = A'$	<table><tr><th>A</th><th>F</th></tr><tr><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td></tr></table>	A	F	0	1	1	0									
A	F																	
0	1																	
1	0																	
NAND		$F = \overline{AB}$	<table><tr><th>A</th><th>B</th><th>F</th></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table>	A	B	F	0	0	1	0	1	1	1	0	1	1	1	0
A	B	F																
0	0	1																
0	1	1																
1	0	1																
1	1	0																
NOR		$F = \overline{A + B}$	<table><tr><th>A</th><th>B</th><th>F</th></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table>	A	B	F	0	0	1	0	1	0	1	0	0	1	1	0
A	B	F																
0	0	1																
0	1	0																
1	0	0																
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XOR		$F = A \oplus B$	<table><tr><th>A</th><th>B</th><th>F</th></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table>	A	B	F	0	0	0	0	1	1	1	0	1	1	1	0
A	B	F																
0	0	0																
0	1	1																
1	0	1																
1	1	0																

**NOT**

Input	Output
I	F
0	1
1	0

**AND**

Inputs		Output
A	B	F
0	0	0
1	0	0
0	1	0
1	1	1

**NAND**

Inputs		Output
A	B	F
0	0	1
1	0	1
0	1	1
1	1	0

**OR**

Inputs		Output
A	B	F
0	0	0
1	0	1
0	1	1
1	1	1

**NOR**

Inputs		Output
A	B	F
0	0	1
1	0	0
0	1	0
1	1	0



Inputs		Output
A	B	F
0	0	0
0	1	1
1	0	1
1	1	0

**EXCLUSIVE NOR**

Inputs		Output
A	B	F
0	0	1
0	1	0
1	0	0
1	1	1

EXCLUSIVE OR

The basic logic gates are the building blocks of more complex logic circuits. These logic gates perform the basic Boolean functions, such as AND (IC 7408), OR (IC 7432), NAND (IC 7400), NOR (IC 7402), Inversion (IC 7404), Exclusive-OR (IC 7486), Exclusive-NOR. Fig. above shows the circuit symbol, Boolean function, and truth. It is seen from the Fig that each gate has one or two binary inputs, A and B, and one binary output, C. The small circle on the output of the circuit symbols designates the logic complement. The AND, OR, NAND, and NOR gates can be extended to have more than two inputs. A gate can be extended to have multiple inputs if the binary operation it represents is commutative and associative.

These basic logic gates are implemented as small-scale integrated circuits (SSICs) or as part of more complex medium scale (MSI) or very large-scale (VLSI) integrated circuits. Digital IC gates are classified not only by their logic operation, but also the specific logic-circuit family to which they belong. Each logic family has its own basic electronic circuit upon which more complex digital circuits and functions are developed. The following logic families are the most frequently used.

TTL Transistor-transistor logic

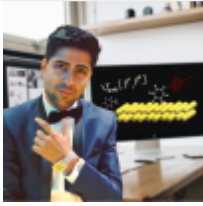
ECL Emitter-coupled logic

MOS Metal-oxide semiconductor

CMOS Complementary metal-oxide semiconductor

TTL and ECL are based upon bipolar transistors. TTL has a well established popularity among logic families. ECL is

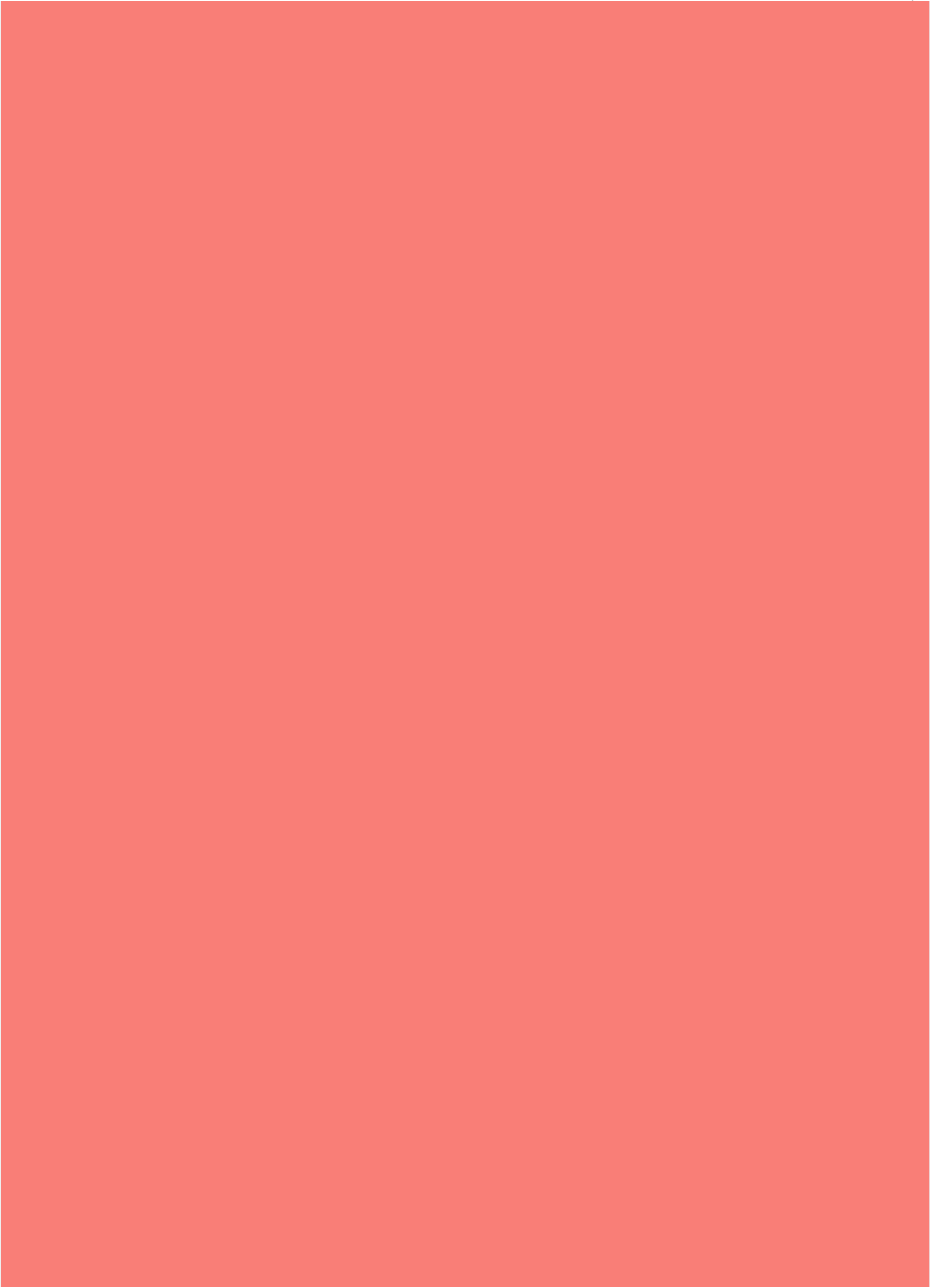
used only in systems requiring high-speed operation. MOS and CMOS, are based on field effect transistors. They are widely used in large scale integrated circuits because of their high component density and relatively low power consumption. CMOS logic consumes far less power than MOS logic. There are various commercial integrated circuit chips available. TTL ICs are usually distinguished by numerical designation as the 5400 and 7400 series.

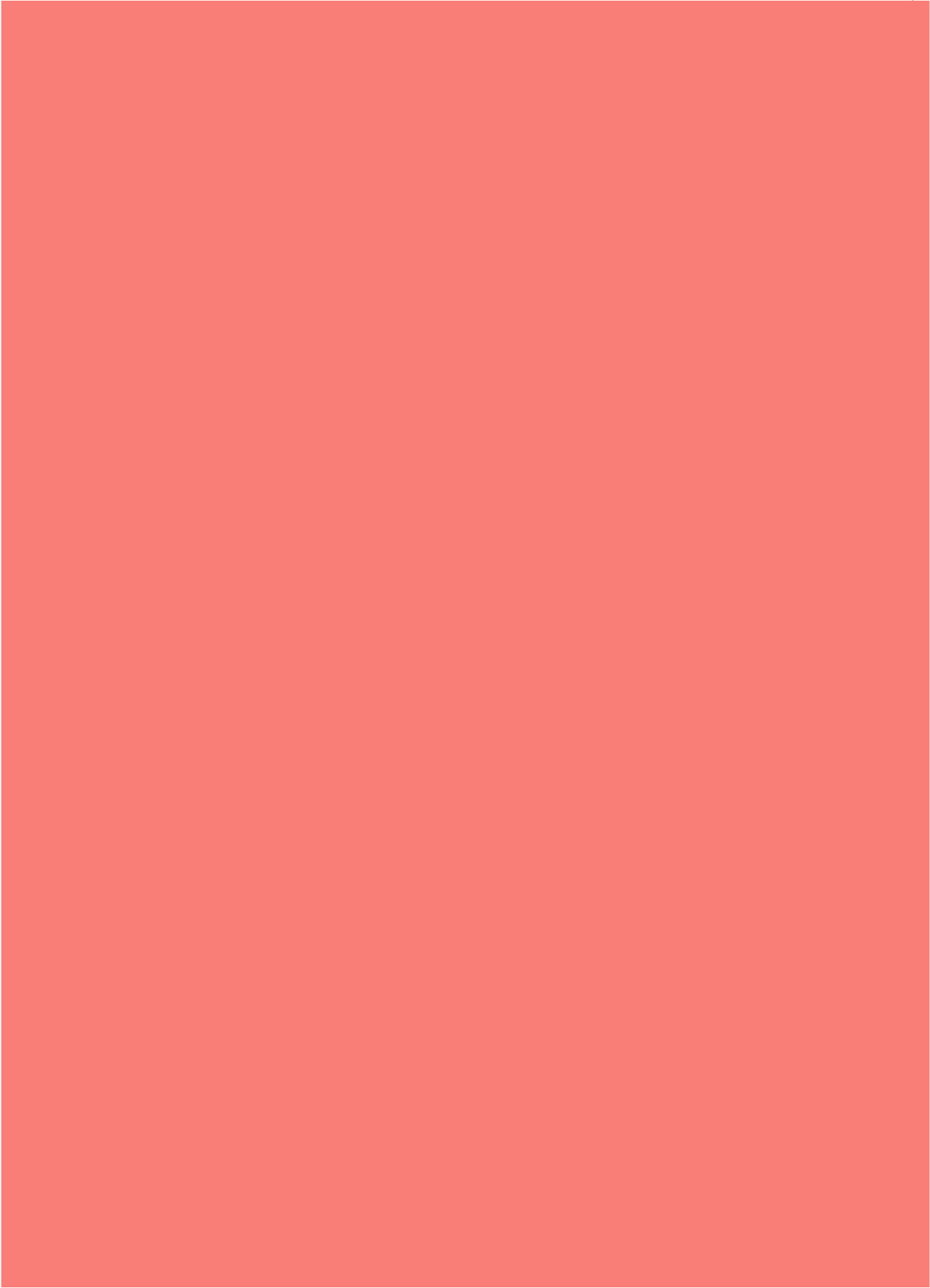


Manas Sharma

I'm a physicist specializing in computational material science with a PhD in Physics from Friedrich-Schiller University Jena, Germany. I write efficient codes for simulating light-matter interactions at atomic scales. I like to develop Physics, DFT, and Machine Learning related apps and software from time to time. Can code in most of the popular languages. I like to share my knowledge in Physics and applications using this Blog and a YouTube channel.

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